Milwaukee
Water Works

Safe, Abundant Drinking Water.

City of Milwaukee
Department of Public Works

Milwaukee Water Works

Water Service Piping Specifications

REVISED 2002

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SPECIFICATIONS
For
WATER SERVICE PIPING
By the
MILWAUKEE WATER WORKS

The Specifications for Water Service Piping set forth herein are prescribed and established pursuant to the authority and power granted by the -

Wisconsin Statutes and enactments of the State Legislature

Milwaukee City Charter

Milwaukee Code of Ordinances

Resolutions of the Milwaukee Common Council

Public Service Commission of Wisconsin

and supersedes all previously established specifications for water service piping.

The Milwaukee Water Works Service Piping Specifications shall be consistent with the standards established by agencies of the State of Wisconsin and of the United States Government.

Where procedural options are available, the Milwaukee Water Works Specifications shall prevail.

Adopted by the Common Council of the City of Milwaukee on August 1st, 2002, Resolution File No. 020514.

SPECIFICATIONS
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The purpose of this Specification Document is to establish policies and procedures to be used by engineers and plumbers in the design and construction of water service piping and water meter settings. To further assure the Utility's mission to continuously provide the highest quality of water from the treatment plant to the consumer, infrastructure that is durable and will withstand environmental stresses are specified. Application of these standards will offer years of service and facilitate repair and maintenance when required.

MILWAUKEE WATER WORKS
WATER SERVICE PIPING SPECIFICATIONS

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MILWAUKEE WATER WORKS
WATER SERVICE PIPING SPECIFICATIONS

Chapter 1
General Requirements

Terms and Definitions
Section 1.1.0

(1) "Accepted Engineering Practice" means a specification, standard, guideline or procedure in the field of construction or related thereto, generally recognized and accepted as authoritative.

(2) "ANSI" is the American National Standards Institute.

(3) "ASTM" is the American Society for Testing Materials.

(4) "AWWA" is the American Water Works Association.

(5) "Battery Meter Setting" means meter settings that have two or more meters in parallel.

(6) "Branch Water Service Piping" means water service piping which has a pipe diameter of three inches or greater at its connection point to the water main.

(7) "Building" means a structure having walls and a roof erected or set upon an individual foundation or slab constructed base designed or used for the housing, shelter, enclosure or support of persons, animals or property of any kind.
Abutting structures that do not provide access from one to the other through the foundation wall shall be considered as separate buildings.
A structure that serves its intended purpose with no dependence on adjoining structures shall be considered a separate building.

(8) "Building Piping" means the piping from the outlet of the meter outlet valve or the outlet of the by pass tee, if so designed, to its terminus at the point of consumption or outlet. The Wisconsin Administrative Code Department of Commerce Chapter Comm 81.01 shall apply for building piping as defined as "water distribution system". The National Fire Protection Association codes shall apply for building piping used for fire protection service.

(9) "City" means the City of Milwaukee, Wisconsin, a municipal corporation of the State of Wisconsin, located in the County of Milwaukee.

(10) “City Engineer” means the City Engineer of the City of Milwaukee or his/her duly authorized representative.

(11) “Commissioner” means the Commissioner of Public Works of the City of Milwaukee or his/her duly authorized representative.

(12) “Common Council” means the Common Council of the City of Milwaukee.

(13) “Compression Coupling Connector” means a connector for pipe and/or tubing using a displaceable rubber seal. The fitting shall be a Ford Pack Joint Coupling or approved equal.

(14) “Customer” as used herein is generic and includes the property owner, the property owner's agent, the plumber, the installer of air conditioning, the installer of refrigeration equipment, the installer of private fire protection systems when doing work encompassed by these specifications, the occupant of the building or property, the lessee, the tenant, the user of the premises, the suburb, and the Public Authority. The Customer receives water service directly from the Milwaukee Water Works.

(15) “Developed Length” means the length of pipe measured along the center-line of the pipe and fittings.

(16) “Diameter” means in reference to a pipe the nominal inside diameter of the pipe.

(17) “Double Check Detector Assembly Backflow Preventor” means a type of a double check backflow prevention assembly, which includes a parallel water meter to indicate leakage or unauthorized use of water downstream of the assembly.

(18) “Easement” means the land where water mains are installed and for which the utility shall have a permanent right of unrestricted free access for inspection and maintenance of its facilities, and construction over the water main is not permitted.

(19) “Fixture Unit” is a measure of the probable hydraulic demand on the water supply by various types of plumbing fixtures. The supply fixture unit value for a particular fixture depends on its volume rate of supply, on the time duration of a single supply operation, and on the average time between successive operations.

(20) “General Office” means the Office of the Superintendent and main office of the Milwaukee Water Works.

(21) “Health Care Facility” means any building or part of a building used for purposes such as hospitals, nursing homes, rest homes, infirmaries, homes for the aged, residential care facilities, mortuaries, sanitariums medical laboratories and offices and clinics with facilities for dentists and doctors.

(22) “Improvement Service” means an unused water service pipe installed from the water main to the property line.

(23) “Insurance Services Office” is a national service organization serving fire insurance companies in regard to rates and policy.

(24) “May” implies neither compulsion nor recommendation-only permission.

(25) “Meter Bypass Piping” means the solid, permanent piping routed around the meter which provides uninterrupted water supply when the meter is out of service.

(26) “Milwaukee Water Works” – Is a public water utility owned by the City of Milwaukee.

(27) “NFPA” is the National Fire Protection Association, organized in 1896, to promote the science and improve the methods of fire protection, with membership open to anyone interested in fire loss reduction.

(28) “Non-Public” means, in the classification of plumbing fixtures, those fixtures in residences, apartments, living units of hotels and motels, and other places where the fixtures are intended for use by a family or an individual to the exclusion of all others.

(29) “OSHA” means the Occupational Safety and Health Administration, U.S. Dept. of Labor.

(30) “Partial Water Service Piping” means an authorized and inspected unused water service pipe not completely installed either from the water main (improvement service) or the building (future).

(31) “Plumbing Code” means the Wisconsin Administrative Code Department of Commerce Chapters Comm 81 to Comm 87 and related documents as adopted and enforced by the City of Milwaukee.

(32) “Plumbing Inspector” means the Plumbing Inspector of the Plumbing Inspection Section, of the City of Milwaukee, Department of Neighborhood Services, or his/her duly authorized representative.

(33) “Plumbing System” means all water supply, service and building piping and fixtures, including their connections, equipment and devices, appliances and appurtenances that serve a building, structure, or premise.

(34) “Plumber” means a plumber who is properly licensed by the appropriate agency of the State of Wisconsin and has required insurance and a proper performance bond.

(35) “Public Water Main” means a water main that is the combination of water pipe, special fittings, valves, valve boxes and manholes installed as an integral part of the Utility distribution system, but not including hydrant units, water service piping or cisterns.

(36) “Public” means, in the classification of plumbing fixtures, those fixtures which are available for use by the public or employees.

(37) “PSC Regulations” means the Public Service Commission, Chapter PSC 185 Standards for Water Public Utility Service and current revisions of same.

(38) “Rules and Regulations – Milwaukee Water Works” refers to the prescribed guide for conduct, action and usage in relationship between the Utility and the Customer.

(39) “Schedules – Water Rates – Charges and Prices refer to:
The tariff of fire protection service and general water service rates, charges, fees, and prices as established by the Public Service Commission of Wisconsin for regular water service furnished to customers of the Utility.
The schedule of miscellaneous water rates, charges, fees, and prices as established by the Utility and approved by the Pubic Service Commission for water service other than fire protection and general water service furnished to customers of the Utility.
The schedule of charges and prices for work performed and materials furnished by the Utility as established by the Utility.

(40) “Shall” means a mandatory requirement.

(41) “Should” is not mandatory but expresses the recommendation of the Milwaukee Water Works.

(42) “Superintendent” means the Superintendent of the Milwaukee Water Works or his/her duly authorized representative.

(43) “Tap Water Service Piping” means water service pipe which has a pipe diameter of two inches or less at its connection point to the water main.

(44) “Temperature Scale” means
˚F - degrees Fahrenheit.
˚C - degrees Celsius.

(45) “Utility” means the Milwaukee Water Works.

(46) “Utility Distribution System” means the water mains (transmission mains) from pumping stations, reservoirs and tanks that supply water within the Utility's service area.

(47) “Water Meter” means an instrument installed to measure the volume and/or rate of flow of water delivered through it.

(48) “Water Meter Setting” means the installation of all the valves, piping and fittings necessary for the normal operation of the water meter or meters as defined by the Milwaukee Water Works.

(49) “Water Service” means the furnishing of water by the Utility to its customers.

(50) “Water Service Agreement” refers to the agreement entered into by the customer and utility after acceptance of a proper application.

(51) “Water Service Piping” means that portion of a water supply system from the water main to the outlet of the meter outlet valve or the outlet of the by pass tee, if so designed, to its terminus at the point of consumption or outlet.

(52) “Water Service Piping Specifications” means the detailed description of materials, methods of installation, sizes and general terms applying to the installation, repair and alteration of water service piping.

(53) “W.O.G.” means Water, Oil or Gas – Valve rating designation.

(54) “WSP” - Valve Rating Designation” means Working Steam Pressure.

Applications and Requests
Section 1.2.0

1.2.1 Application For Water Service

Before water service is given to any customer, an application shall be submitted to the Utility via the Technical Communications Team of the Milwaukee Development Center, on the standard form for Water Service Agreement. This application shall be made at least three working days before connection to the water main is to be requested. Plumbing permits must be obtained before a water service agreement application can be processed.

Plans for private fire protection systems must be approved by a recognized authority similar to Insurance Services Office of Wisconsin, Factory Mutual Engineering Association, or Industrial Risk Insurers, and the local jurisdiction, as well as available for review by the Milwaukee Water Works upon request.

In processing the application, the Utility will furnish information regarding the size and location of water mains and water service pipes. This information will be based upon the available records but is not guaranteed to be complete or correct.

1.2.2 Tapping and Branch Connection Work Request

Plumber's request for tapping work to be performed by the Utility shall be made at least 48 hours in advance. If for any reason the tapping work cannot be performed when the tapping crew arrives on the site, the Distribution Section of the Utility is to be informed immediately by the tapping crew, the plumber, or his agent. The Utility may dispatch a representative to determine why the tapping work cannot be performed. When reasons for delay have been resolved, the request shall be repeated.

The Utility shall not make any taps or branch connections when the outside temperature is below 32° F (0° C). The Utility reserves the right to determine if a tap or branch connection will be performed. The contractor may call the Distribution Section of the Utility to determine if the temperature will prevent the tap or branch connection from being accomplished. The contractor shall be allowed to heat the trench to provide an adequate temperature. If the trench is heated, the contract shall be responsible for maintaining a safe work environment in the confined space.

1.2.3 Materials Request

Requests for materials to be obtained from the Utility should be made at least 48 hours before the materials are required.

1.2.4 Inspection Request For Water Service Piping

Water service piping inspection is performed by the Plumbing Inspection Section of the City of Milwaukee, Department of Neighborhood Services.

The plumber shall notify the Plumbing Inspection Section before water service piping is to be inspected. The notification shall specify the job location, plumbing permit number, tap or branch number, and the time the job will be ready for inspection.

The plumber shall request an inspection such that the water service piping installation is complete at the time of the inspection. If for any, reason the plumber fails to have the work ready at the time designated in his call for inspection, a second notice shall be made to Plumbing Inspection, designating the job location, plumbing permit number, tap or branch number, and time for inspection. If water service piping is not ready for inspection at the time designated in the second notice, the penalty prescribed shall be imposed by the Plumbing Inspection Section of the City of Milwaukee, Department of Neighborhood Services for such additional inspections.

1.2.5 Request For Wavier

Requests for a waiver to any of the requirements of this specification shall be submitted to the Utility via the Technical Communications Team of the Milwaukee Development Center, in writing accompanied by a drawing indicating the purpose and result of the waiver. Approval, when allowed, will be given in writing. All requests shall be made prior to the installation being started.

1.2.6 Request For Change Of Existing Installation

Any request for a change in size or location of an existing water meter installation or an existing water service piping installation shall be submitted to the Utility via the Technical Communications Team of the Milwaukee Development Center, in writing, accompanied by a Water Service Agreement Application. Approval, when allowed, will be given in writing.

1.2.7 Drinking Fountains

All drinking fountains shall be installed as regulated by the current revision of the Wisconsin Administrative Code Department of Commerce Chapters Comm 81 to Comm 87.

Size Of Water Service Piping
Section 1.3.0

1.3.1 Basis

The water service piping shall be sized so that the velocity at any time shall not exceed twelve feet per second.

1.3.2 Estimating Maximum Rate Of Flow

The maximum flow rate shall be determined by the following procedure:

1. Determine the number of each type of fixture to be installed in the building.

2. Determine the usage of each fixture as in either a non-public building or public building as defined in Section 1.1.0 (as taken from chapter Comm 82 of the Wisconsin Administrative Code).

3. Determine the fixture units for each type of fixture by reference to Table 1 and Table 2 of these specifications (as taken from chapter Comm 82 of the Wisconsin Administrative Code - Tables 82.40-1 and 82.40-2).

4. Determine the total fixture units by multiplying the number of each type of fixture by its respective number of fixture units and summing for a total. In using this method, allowance should be made for fixtures to be installed at a future date.

5. By reference to Table 3 of these specifications (as taken from chapter Comm 82 of the Wisconsin Administrative Code - Table 82.40-3), the total fixture units in any system with either flush tank or flush valves are converted to maximum rate of flow in the water service piping. In converting, the next greater number of fixture units shall be used.

6. Where water consuming equipment not listed in to Table 1 and Table 2 of these specifications (as taken from chapter Comm 82 of the Wisconsin Administrative Code - Tables 82.40-1 and 82.40-2), its GPM rating shall be added to the maximum rate of flow determined as outlined in paragraph 5. This total GPM flow rate is then used to determine the size of water service piping.

1.3.3 Determining Size Of Water Service Piping

Table 4 and Table 5 of these specifications are a tabulation of the Domestic Water Service Piping sizes for the estimated maximum rate of flow determined in accordance with Section 1.3.2. Given the maximum established rate of flow, the proper size of the water service piping can be determined. Water service piping shall be of adequate size to accommodate the maximum established rate of flow as determined in Section 1.3.2 without the addition of pressure tanks and/or holding tanks. Private fire protection water service piping shall be sized in accordance with Section 1.4.0.

1.3.4 Extension Of Improvement Services

Extension of Improvement Service Piping shall be sized in accordance with the procedure outlined in Section 1.3.0. If the existing improvement service piping is not of the required size as determined by the procedure outlined in Section 1.3.0, the improvement service piping can be increased by one pipe size and/or decreased to the required pipe size at the lot line.

Private Fire Protection Service
Section 1.4.0

1.4.1 Application

Application for a Private Fire Protection Water Service shall be made as specified in Section 1.2.0.

1.4.2 Design Of System

Domestic and Fire Protection Water Service Piping Systems shall be one of the types shown in drawing numbers 1 through 5 of these specifications. The Milwaukee Water Works Rules, Regulations and Water Service Specifications shall be followed. All fire protection systems shall be designed in accordance with NFPA 13, NFPA 13D, and NFPA 13R. Any waivers must be submitted in writing and shall be approved before any installation work will be allowed. Plan examination by the Milwaukee Water Works is limited to water service piping installation and is not an endorsement of the design of private fire protection sprinkler systems.

1.4.3 Size Of Water Service Piping

The size of Private Fire Protection Water Service Piping shall meet the prevailing specifications of the customer's insurance underwriter or the community's standard. In addition to the demand for the fire system, an allowance for the flow rate of the domestic system shall be made in determining the total water supply requirement.

1.4.4 Materials

The materials used for Private Fire Protection Water Service Piping shall conform to the requirements of Chapter 2 of these specifications.

1.4.5 Installation

Installation of Private Fire Protection Water Service Piping shall conform to the requirements of Chapter 3 of these specifications.

1.4.6 Meters And Control Check Valve

All private fire protection systems shall be controlled by a double detector check assembly backflow preventer with a bypass meter conforming to Appendix K. The double check detector assembly backflow preventor shall be provided by the customer and installed by an appropriately licensed contractor.

Meters shall be furnished and installed by the Utility after payment of the appropriate charges. Bypass meter piping (including the check valve on the bypass) shall be furnished by the customer and installed by a licensed plumber in accordance with drawing numbers 23 through 27.

1.4.7 Underground Building Piping

Underground Building Piping in private fire protection systems beyond the service piping control valve will be inspected and shall meet the prevailing specifications of the customer's insurance underwriter and/or other jurisdictions.

1.4.8 Metered Connection For Domestic Service

One connection may be made to a three-inch or larger private fire protection water service pipe immediately before the fire protection inlet control valve for the purpose of domestic water supply. This connection is subject to the following restrictions:

1. In sizing the water service piping, an allowance for the flow rate of the domestic system shall be made in determining the total water supply requirement.
2. A standard meter setting shall be installed immediately following the domestic connection.
3. Domestic meters shall be sized in accordance with Section 1.3.0.

1.4.9 Residential Fire Protection

Residential class sprinkler heads may be installed on a 2-inch or smaller Tap Water Service. The design of the system shall be the responsibility of the fire protection contractor and/or plumbing contractor. All residential fire protection systems shall be designed and installed in accordance with all sections of NFPA 13, 13D, and 13R. The water service piping and meter shall be properly sized and all required back-flow protection shall be installed.

MILWAUKEE WATER WORKS
WATER SERVICE PIPING SPECIFICATIONS

Chapter 2

Materials
Section 2.1.0

2.1.1 General

Material specifications have been prepared on the basis that the materials specified are available. If any material specified is not available when required, written permission shall be obtained from the Utility to substitute specific items for those specified and to vary the procedure of installation as the substitute material requires.

2.1.2 Specification Code Numbers

Specifications for materials to be furnished by the customer are included in the appendices of this Water Service Piping Specification. These specifications are obtained from standards established by AWWA, MSS, Federal, ASTM, ANSI and USA Standards.

2.1.3 Copper Water Service Piping

1. **Use**. Copper piping shall be used in all new water service piping installations two (2) inches or smaller. Copper piping shall be used to repair existing lead water service piping. Connections to lead piping shall be made with "lead to copper" wiped solder joints or approved "Compression Coupling Connectors." See Appendix N. Solder shall be as specified in Section 2.1.4, paragraph 2.

2. **Corporation Stop**. Corporation stops shall be furnished and installed by the Utility.

3. **Copper Tubing**. Copper tubing shall be "soft annealed" and shall conform to the standards for "Type K," prescribed in ANSI/AWWA C800-89 Section A.2 for "Copper Water Tubing" and to ASTM, designation B42 and B88-99, and current revisions thereof. It shall be free from grooving cracks, indentations, flaws or other defects. At intervals of not greater than one and one-half feet, the tubing shall bear clear, permanent markings indicating the type and manufacturer.

4. **Polyethylene Wrap**. Copper services shall be covered with a polyethylene envelope for a distance of six feet from the connection to the public water main along the service pipe. The polyethylene wrap and installation shall conform to the requirements of Appendix L.

5. **Fittings:** "Flared" type fittings shall be used. Soldered joints may be used only in exposed areas as indicated on the appropriate meter setting drawing.

   Unions shall be extra heavy three-part unions. Each fitting shall bear a clear, permanent marking indicating the manufacturer. Fittings shall be of cast brass meeting the requirements of ASTM B62. They shall be well made to assure uniformity in wall thickness and strength and shall be free from any defect which may affect their serviceability.

6. **Curb Stop:** Curb stops shall be furnished by the Utility.

7. **Service Insulator:** Service Insulators shall be installed on all new tap water services and on all water service piping repairs in which the curb stop in exposed. The contractor/plumber shall furnish and install, as part of water service piping, a service insulator (Ford Meter Box Co. Inc. SI-2, SI-4, SI-6, SI-7, or equal) at the curb stop. The insulator shall be placed on the street side of the curb stop.

8. **Service Box:** Service boxes shall conform to the requirements of Appendix A. Those service boxes located in paved areas shall have an upper section and cover of a roadway service box as specified in Appendix A.

9. **Gate Valves:** Gate valves ¾" to 2" shall conform to the requirements of Appendix D.

10. **Ball Valves:** Ball valves ¾" to 2" shall conform to the requirements of Appendix E.

11. **Check Valves:** Check valves shall conform to the requirements of Appendix O.

12. **Meter Horn:** Meter horns shall conform to requirements of Appendix G.

13. **Water Meter:** Water meters shall be furnished and installed by the Utility.

14. **Installation:** Installation of copper water service piping shall be in accordance with Section 3.2.5 of this specification.

2.1.4 Lead Water Service Piping

1. **Use:** Lead piping shall not be used.

2. **Repair:** Copper piping shall be used to repair existing lead water service piping. Connections to lead piping shall be made with approved "Compression Coupling Connectors." See Appendix N.

2.1.5 Bell And Spigot Ductile Iron Water Service Piping 3" Through 16"

1. **Use:** Bell and Spigot Push-on rubber gasket joint ductile iron pipe shall be used in the underground section of services three (3) inches through sixteen (16) inches.

2. **Tapping Sleeves:** Tapping sleeves shall be furnished and installed by the Utility.

3. **Tapping Valves:** Tapping valves shall be furnished and installed by the Utility.

4. **Branch Gate Valves:** Branch gate valves shall be furnished and installed by the utility.

5. **Pipe:** Ductile iron pipe shall conform to the requirements of Appendix J.

6. **Rubber Gasket Rings:** The rubber gasket rings used in jointing rubber gasket joint piping shall be of the design designated by the pipe manufacturer.

7. **Lubricant:** The lubricant shall be as per AWWA/ANSI C111/A21.11-00 and shall be suitable for lubricating the parts of the joint for assembly. The lubricant shall be nontoxic, shall not support the growth of bacteria, and shall have no deteriorating effects on the gasket material. It shall not impart taste or odor to water in a pipe when used in accordance with ANSI/AWWA C600, and the pipe has been flushed according to ANSI/AWWA C651. The lubricant containers shall be labeled with the trade name of the lubricant and the pipe manufacturer's name, except when the purchaser specifies a special lubricant.

8. **Polyethylene Wrap:** Ductile iron service pipe in its entirety shall be covered with a polyethylene envelope. The polyethylene wrap and installation shall conform to the requirements of Appendix L.

9. **Fittings:** Cast iron or ductile iron rubber gasket joint fittings shall conform to the requirements of Appendix I.

10. **Valve Boxes:** Valve boxes shall be furnished by the Utility.

11. **Meter:** Meters shall be furnished and installed by the Utility.

12. **Installation:** Installation of bell and spigot water service piping shall be in accordance with Section 3.2.6 of this specification.

13. **Repair Clamps:** Repair clamps may be used to repair transverse breaks in cast iron pipe and shall be of all stainless steel construction and shall conform to the requirements of Appendix H.

2.1.6 Flanged Ductile Iron Water Service Piping 3" Through 16"

1. **Use:** Flanged ductile iron pipe may be used in the exposed sections of Services three (3) inches through sixteen (16) inches.

2. **Pipe:** All ductile iron pipe shall conform to the requirements of Appendix F.

3. **Fittings and Flanges:** Fittings three (3) inches and larger shall be flanged cast or ductile iron and conform to the requirements of Appendix I.

4. **Meter:** Meters shall be furnished and installed by the Utility.

5. **Installation:** Installation of flanged ductile iron piping shall be in accordance with Section 3.2.7.

2.1.7 Galvanized Steel Service Piping

1. **Use:** Galvanized steel pipe using flanged connections may be used in the exposed sections of services three (3) inches and larger.

2. **Pipe:** Pipe shall be thoroughly zinc coated (galvanized), Schedule 40 or heavier. The pipe shall conform to the requirements of Appendix F.

3. **Fittings and Flanges:** All fittings shall be rated 125 psi or greater. Fittings three (3) inches and larger shall be flanged cast or ductile iron and conform to the requirements of Appendix I.

   Hardware used in securing flanged cast iron fittings is to be coated with a commercially available plating material.

4. **Meter:** Meters shall be furnished and installed by the Utility.

5. **Installation:** Installation of steel piping shall be in accordance with Section 3.2.7.

2.1.8 Valves

1. **Gate Valves. Bronze:** Bronze gate valves up to and including two inches in size shall conform to the requirements of Appendix D.

2. **Ball Valves. Bronze:** Ball valves, up to and including two inches in size, shall conform to the requirements of Appendix E.

3. **Gate Valves, Iron:** Iron gate valves three inches and larger conform to the requirements of Appendix C.

4. **Check Valves:** All check valves three inches and larger in size shall be swing type, flanged iron body and shall conform to the requirements of Appendix P.

5. **Detector Check Valves:** Fire service double detector check valve assemblies, three (3) through ten (10) inches in size shall be listed in the Fire Protection Equipment Book and conform to Appendix K.

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Chapter 3

Installation And Excavation
Section 3.1.0

3.1.1 Description Of Excavation

All excavations shall be made in a manner that will least inconvenience traffic. Provision shall be made for the passage of water along the excavated street or alley. Barriers, night lamps and other precautions against damage or accident to persons or property shall be provided for and maintained during the progress of the work. The excavation shall conform to the Excavation Permit issued by the Milwaukee Development Center and to all current OSHA Regulations.

Sheathing, bracing and shoring shall conform to the Wisconsin Administrative Code, current OSHA Regulations, to the plans and specifications, and as necessary to protect life, property and the work.

When the water service piping is installed in a tunnel, the sheathing, bracing and shoring shall conform to the Wisconsin Administrative Code, current OSHA Regulations, to the plans and specifications, and as necessary to protect life, property and the work. In all cases, the minimum tunnel size and sheathing, bracing and shoring shall be in accordance with drawing numbers 7 and 8. Adequate lighting shall be provided in the tunnel.

3.1.2 Excavation For Connection

The customer shall provide all excavations required for the connection, reconnection or shutting off of service piping. Bracing, shoring and sheathing shall be in accordance with drawing numbers 7 and 8, as well as in accordance to the Wisconsin Administrative Code, current OSHA Regulations, and as necessary to protect life, property and the work.

3.1.3 Location Of Water Service Piping

The water service piping shall be connected to the water main at a point within the extended lines of the property to be supplied. The water service piping shall be laid out to have the shortest developed length of piping from the curb stop (street line for branch services) to the water meter location.

The water service piping from the water main to the street line shall be laid at right angles to the water main unless special permission is granted by the Utility.

Installation and separation of water service and building sewers shall be in accordance with the Wisconsin Administrative Code Department of Commerce Chapter Comm 82.40.

A water service piping connection shall be made no closer than the following minimum center to center distance from another connection.

Corporation Stop - 18 inches.

Tapping Valve - 4 feet.

Taps or branches shall be made at least 24" away from main bell joints, measured from the mid-point of the depth of the bell.

Water service piping from the main to the property line shall be level with the water main. When the water main is less than six feet deep, the water service pipe shall offset to six feet. The offset to six-foot depth is to be made in a distance of two feet. See drawing number 12. The minimum allowed depth of water service piping installation shall be six feet. The six-foot depth shall be maintained from the water main into the building. For water service piping installed with less than six feet of cover, refer to Section 3.2.8 for insulation requirements.

3.1.4 Bedding And Support

All lumps and loose material shall be removed from the excavation. All stones exposed in the bottom of the excavation shall be removed. Holes created in the bottom of the trench by the removal of stones or other objects shall be hand back-filled with fine graded material and tamped.

Bedding for branch service piping shall be sand or bedding chips. If the trench is in marsh muck, acid soil, ash, refuse, or cinder filling, bedding shall be limestone screenings and shall be laid to a depth of twelve inches below the pipe. Bedding may be placed by machine up to the bottom of the pipe. From the bottom of the pipe, bedding shall be placed by hand or equally careful means to a depth of six inches over the top of the pipe. The bedding shall be such that uniform bearing is provided along the length of the pipe.

Where the bottom of the trench is unstable soil or otherwise unsuitable, material shall be removed and replaced with proper bedding such that the resulting trench bottom is stable.

The excavation for water service piping shall be in accordance with Wisconsin Administrative Code Department of Commerce Chapter Comm 82.40, which specifies in detail the separation of water services and sewers.

Bell and spigot branch service piping shall be secured at bends and adapters as is shown on drawing numbers M-1 through M-5. Refer to Appendix M. Megalug type

restraints are permitted with approved buttresses as shown on drawing numbers M-1 through M-5. Refer to Appendix M.

Tap service piping shall be placed in the side wall of the building sanitary sewer trench opposite to the building storm sewer as required by Wisconsin Administrative Code Department of Commerce Chapter Comm 82.40. So located, it shall be laid on solid ground free from stones or hard lumps or otherwise satisfactorily supported.

Piping Installation
Section 3.2.0

3.2.1 Workmanship

All workmanship shall be of an acceptable, professional quality. Water service piping is considered plumbing, and the installation shall be performed by a licensed plumber as required in Comm 82 of the Wisconsin Administrative Code.

3.2.2 Inspections And Tests

The water service piping shall be back-filled, leaving all joints exposed, until it has been inspected, tested and approved by the Plumbing Inspector. Upon the request of the Plumbing Inspector or the Utility, the piping shall be hydrostatically tested to 200 psi maximum in his presence. The hydrostatic test of branch service piping (3" and larger) requires that both ends of the length of pipe to be tested be temporarily plugged or capped. Pressure testing shall not be performed against the closed branch valve.

The water service piping, particularly the visibility and location of the curb stop box, the operability of the curb stop and the location of the meter setting will be subject to final inspection. In case the water is "turned on" and the installation cannot be approved, the water will be "turned off."

3.2.3 Piping Through Walls Or Floors

Branch water service piping passing through masonry or concrete walls or floors shall be protected from settlement strains and chemical action as illustrated in drawing numbers 29 and 30. Tap water service piping passing through concrete floors shall be protected from settlement strains and chemical action as illustrated in drawing number 30.

3.2.4 Tap Service Piping Without Tight Shut-Off

To work on lead or copper water service piping that does not have a tight shut-off, the service must be frozen. Under no circumstances shall any service be punctured to permit drainage or leakage from the water service piping.

3.2.5 Copper Water Service Piping

Copper water service piping shall be installed as is shown on drawing number 11.

Copper water service piping 1-inch diameter shall be installed with no more than one coupling or joint from the corporation stop at the water main to the curb stop. Copper water service 1 ½-inch and 2-inch in diameter shall be made up of lengths of 20 feet or more between the corporation stop and the curb stop except for one shorter length permitted for closure.

Horizontal offsets at the corporation stop in copper water service piping shall be as shown in drawing number 11. Bends in 1½-inch and 2-inch piping shall be made with a pipe bender. Maximum dimension of the tube at a bend shall not exceed the following:

Nominal Tube Size	Maximum Diameter at Bend
1½"	1.875"
2"	2.375"

Copper water service piping connections shall be made with approved "Flared" or rubber Compression Coupling Connector type joints using extra-heavy three-part joint unions. The ends of the copper tubing shall be accurately sized and rounded with the appropriate sizing tools. Ends shall be squarely cut and all rough edges or burrs shall be removed. Only the proper flaring tool designed for that purpose shall be used when forming a flare. The joint shall be closed by threading the sleeve nut to the fitting with the flared end of the tube or the rubber compound gasket pressed between. The use of any jointing compound with copper tube fittings is prohibited. Food-safe silicon lubricant may be used on the threads of the fitting to facilitate tightening.

When copper tubing is used to repair lead water service piping, the connection of the copper tubing to the lead pipe shall be made with a "lead to copper" wiped solder joint or a Compression Coupling lead to copper connector.

3.2.6 Bell And Spigot Iron Water Service Piping

Bell and spigot ductile iron water service piping shall be installed as shown in drawing number 9.

All ductile iron pipe cuts shall be made at right angles to the centerline of the pipe with a mechanical pipe cutter. Filling pieces shall not be less than 20 inches in length. Any spigot ends of cut pipe shall be tapered at a 30˚ angle, a minimum of 1/8 inch, with file or grinder.

Before assembling, bell and spigot surfaces contacting the gasket shall have all lumps, blisters, and excess coal-tar coating removed by scraping, then wire brushed and wiped clean and dry. Bells and spigots shall be kept clean and dry until joints are made. The pipe shall be wrapped in polyethylene film as specified in Appendix L. A one-foot overlap is required at each joint in the film cover. The overlap shall be secured with adhesive tape as outlined in Appendix L.

All offset fittings and bends in branch piping shall be secured by strapping and buttressing or by use of Megalug restraining rings and buttressing in accordance with drawing numbers M-1 through M-5. Refer to appendix M.

Rubber Gasket Joints

Each manufacturer furnishes gaskets for its joint design. The gaskets are not interchangeable for use in joints of other manufacturers and no substitution will be permitted.

The lubricant shall be as per AWWA/ANSI C111/A21.11-00 and shall be suitable for lubricating the parts of the joint for assembly. The lubricant shall be nontoxic, shall not support the growth of bacteria, and shall have no deteriorating effects on the gasket material. It shall not impart taste or odor to water in a pipe when used in accordance with ANSI/AWWA C600, and the pipe has been flushed according to C651. The lubricant containers shall be labeled with the trade name of the lubricant and the pipe manufacturer's name, except when the purchaser specifies a special lubricant.

When air temperature is below 10˚F (-12˚C), no rubber-jointed pipe shall be installed. When the air temperature is below 32˚F (0˚C), the gasket and the lubricant shall be warmed to keep the gasket material pliable and the lubricant in a workable consistency.

All spigots shall be chamfered and free of burrs or sharp edges that may cut the gasket. Full-length pipe is supplied with a chamfered spigot. On all cut pipes, the plumber shall chamfer the outside edge a minimum of 1/8" on the vertical, at an angle of 30˚ with the centerline of the pipe.

The inside of the bell shall be inspected for casting burrs. The bell, spigot, and gasket shall be clean and dry prior to assembly. Any casting burrs, excess coating or foreign matter shall be removed.

The rubber gasket shall be inserted into the groove within the bell with the flat surface of the gasket within the groove and the nose of the gasket toward the outside end of the bell.

Both the spigot and the gasket shall be thoroughly lubricated before the spigot is centered and inserted into the bell. The center line of the spigot and bell shall be pushed until it comes into contact with the base of the bell and then backed off 1/8" to break contact between the spigot and the bell.

If a backhoe is used to drive the spigot home, a timber header shall be placed between the bucket and the pipe to prevent damage to the pipe. Care shall be exercised not to drive the spigot home with such force as to eliminate the 1/8" gap in previously laid pipe.

Any deflection of the pipe shall be made after the joint is assembled.

When the joint cannot be made with moderate force, or if the spigot rebounds part way out, the joint shall be disassembled. The gasket shall be checked for positioning and damage, and lubricant reapplied to gasket and spigot end before the joint is reassembled.

3.2.7 Flanged Ductile Iron And Steel Water Service Piping

Flanged water service piping shall be installed where applicable as is shown on drawing numbers 22 through 28.

A ductile fitting with spigot and threaded or flanged end shall be used to connect bell and spigot ductile iron pipe to flanged pipe (see drawing number 30). This connection shall be secured as shown in drawing numbers 30 and 31. All flanged or screwed joints shall be made so as to produce a tight seal without uneven forcing. Gaskets shall conform to AWWA C207-94, Section 4.1.3.

3.2.8 Protection From Freezing

Insulation against freezing shall be installed when water service piping may be exposed to freezing temperatures or when the water service piping has less then 5-1/2 feet of cover. See drawing number 12.

Types of Insulation:

A. Rigid Insulation – Two layers of closed cell extruded polystyrene foam boards 4'x2'x2" minimum. This type will be considered the standard unless otherwise indicated.
B. Insulating Concrete – Perlite or Vermiculite concrete encasement or cover. The concrete shall have a mix ratio of 1 part portland cement and 8 parts perlite or vermiculite.

Installation – Type A – Rigid Insulation

1. The trench shall be excavated to the width required by the rigid board insulation.
2. The bedding chips shall be covered with mason sand beneath the insulation board and be hand spread and compacted by suitable mechanical means to provide uniform support for the insulation board. The insulation board shall be laid flat, free of any breaks or cracks.
3. All joints of the insulation board shall be staggered not less than one foot joint to joint.
4. Mason sand shall be hand spread to not less than one foot over the insulation board and compacted by suitable mechanical means prior to back filling.
5. Insulation board shall be closely fitted around all valves and boxes.

Installation – Type B –Insulating Concrete

1. Insulating concrete shall be machine mixed.
2. When allowed by the Utility, insulating concrete may be substituted for insulation board at the ratio of 4" of concrete to 2" of board. The area covered shall be at least equal in all dimensions to that indicated for the rigid insulation.

Water Service Connection
Section 3.3.0

3.3.1 Connection To The Water Main

The Utility will make all taps and furnish and install all corporation stops, tapping saddles, tapping valves and tapping sleeves in accordance with the water service agreement.

Back-filling
Section 3.4.0

3.4.1 Time Of Back-Filling

Back filling of the trench shall commence immediately after the water service piping has been inspected and approved by the Plumbing Inspector.

3.4.2 Back-fill Material And Placement

Back-fill around tap water service piping shall be fine graded and free of lumps. If the soil contains marsh muck, acid soil, ash, refuse or cinders, the backfill shall be limestone screenings. Back-fill shall be deposited by hand for at least one foot on each side and over the piping.

Bedding material (see Section 3.1.4) for branch water service piping shall be used as back-fill for a depth of at least six inches above the top of the pipe. It shall be placed by hand or equally careful means so that no damage is done to the pipe.

All back-fill around valve boxes and service boxes shall be placed by hand. The interior of boxes shall be free of all material after the back-fill has been placed.

3.4.3 Remainder Of Back-Fill

All back-fill shall conform to the requirements stated on the Excavation Permit issued by the Milwaukee Development Center.

Meter Settings
Section 3.5.0

3.5.1 Installation

A licensed plumber, contracted by the customer shall install the water meter setting, excluding the meter.

3.5.2 Inspection

Before the meter is installed and the water "Turned On," the meter setting, excluding the meter, shall be inspected and approved by the Plumbing Inspector with the water temporarily turned on and all valves in the “on” position, to verify the integrity of the piping.

3.5.3 Meter Settings For Tap Water Service Piping (Domestic Only)

Tap water service piping meter settings installed in basements shall conform to drawing numbers 13, 14, and 16 as applicable. Tap service piping meter settings installed in meter wells shall conform to drawing numbers 15 and 17 as applicable.

3.5.4 Meter Settings For Tap Water Service Piping (With Residential Fire)

Tap water service piping meter settings installed in basements of homes that have residential sprinkler heads shall conform to drawing number 6.

3.5.5 Meter Settings For Branch Water Service Piping (Domestic Only)

Branch water service piping meter settings installed in basements shall conform to drawing numbers 16 and 21 as applicable. Branch water service piping meter settings installed in meter wells or meter pits shall conform to drawings numbers 17 and 22, as applicable.

3.5.6 Meter Settings For Lawn Sprinklers

Meter settings for lawn sprinkler water service piping shall conform to drawing numbers 18, 19, and 20 as applicable.

3.5.7 Meter Settings For Private Fire Protection Services (Fire Service)

Meter settings for private fire protection services shall conform to drawing numbers 23, 24, and 25 as applicable.

3.5.8 Meter Settings For Private Fire Protection Services (With Domestic Service)

Meter settings for combined private fire protection services with a domestic tee shall conform to drawing numbers 26, 27, and 28 as applicable.

Structures
Section 3.6.0

3.6.1 Service And Valve Boxes

Service boxes shall be installed as shown on drawing number 11. Valve boxes shall be installed as shown on drawing number 9.

Water service piping and its installation will be inspected and approved as specified in Section 3.2.2.

3.6.2 Meter Wells

Meter wells in earth shall be installed as shown in drawing numbers 35 and 36 as is applicable. Meter wells in pavement shall be installed as shown on drawing numbers 35 and 36.

3.6.3 Meter Pits

a. Meter pits in yard areas shall be constructed as shown in drawing number 33 (Yard Location View). Trap doors for meter pits are commercially available single leaf or double leaf design. Use a cover with 42" X 42" minimum opening similar to Bilco J-5AL, JD-2AL or equal. Single leaf doors are to be counter balanced. All doors shall have stays and restraints to insure safe operation. Doors shall be of aluminum or steel construction.

b. Meter pits in pavement areas shall be constructed as is shown in drawing number 33. (Roadway location view). Covers for paved area pits shall be round, 42" diameter, with 22 inch offset access lid, Neenah Foundry R1741E or equal. Ladders for all meter pits shall conform to drawing number 34. All meter pits and appurtenances shall be inspected and approved. Final approval of the pit and appurtenances shall be obtained from the Plumbing Inspector before the meter will be set.

Concrete for meter pits shall be Class C (minimum of 6.0 sacks of cement per yard of concrete). A certified delivery ticket shall be submitted to the Plumbing Inspector upon request.

The Utility must approve the design of meter pits different from those specified herein before construction. Detail plans (certified by a Registered Professional Engineer) shall be submitted for approval.

3.6.4 Test Discharge And Emergency Service Connections

The test discharge shall be piped solid from the test connection valve to the outside of the building or meter pit as shown on drawing numbers 32 and 33. The piping through the building wall shall be installed as shown in drawing number 32. The termination of the emergency service connection piping shall conform to drawing number 33.

3.6.5 Location Of Pits And Wells

Meter pits or wells shall be located on the customer side of the established or proposed property line. The centerline of the well cover shall be no less than five feet from any other surface structure or obstruction. Meter pit front walls shall be no more than 10 feet from the property line. Any locations that do not conform to these requirements shall be submitted to and approved by the Utility before any installation work is performed.

Sidewalk and Pavement Replacement
Section 3.7.0

3.7.1 Replacement

All sidewalk, driveway, curb and gutter, and pavement that has been damaged or removed shall be replaced. This shall be done in conformance with the Restoration Permit issued by the Milwaukee Development Center.

MILWAUKEE WATER WORKS
WATER SERVICE PIPING SPECIFICATIONS

Chapter 4
Tables and Drawings

Tables
Section 4.1.0

4.1.1 Tables

Table	Title
1.	State Water Fixture Units - Nonpublic
2.	State Water Fixture Units - Public
3.	Conversion of Water Supply Fixture Units to GPM
4.	Pipe and Meter Size
5.	Pipe and Meter Size – Over 500GPM

Water Supply Fixtures Units For Nonpublic Use Fixtures

TYPE OF FIXTURE[a]	WATER SUPPLY FIXTURE UNITS (WSFU)
Automatic Clothes Washer	1.5
Bar Sink	1.0
Bathtub, with or without Shower Head	2.0
Bidet	1.5
Dishwasher	1.0
Glass Filler	0.5
Hose Bibb 1/2" diameter	3.0
3/4" diameter	4.0
Kitchen Sink	1.5
Laundry Tray (1 or 2 compartments)	1.5
Lavatory	1.0
Shower, per head	1.5
Water Closet, Flushometer Type	6.0
Water Closet, Gravity Type Flush Tank	2.0
Bathroom Groups:	
Bathtub, Lavatory & Water Closet-FM[b]	8.0
Bathtub, Lavatory & Water Closet-FT[c]	4.0
Shower Stall, Lavatory & Water Closet-FM	7.5
Shower Stall, Lavatory & Water Closet-FT	3.5

[a] For fixtures not listed, factors may be assumed by comparing the fixture to a listed fixture which uses water in similar quantities and at similar rates.

[b] FM means flushometer type.

[c] FT means flush tank type.

Table 1 – State Water Fixture Units – Nonpublic
(taken from Comm 82.40)

Water Supply Fixtures Units For Public Use Fixtures

TYPE OF FIXTURE[a]	WATER SUPPLY FIXTURE UNITS (WSFU)
Automatic Clothes Washer, Individual	3.0
Automatic Clothes Washer, Large Capacity	b
Bathtub, with or without Shower Head	3.0
Coffee Maker	0.5
Dishwasher, Commercial	b
Drink Dispenser	0.5
Drinking Fountain	0.25
Glass Filler	0.5
Hose Bibb: 1/2" diameter	3.0
3/4" diameter	4.0
Ice Maker	0.5
Lavatory	1.0
Shower, per head	3.0
Sinks:	
Bar and Fountain	2.0
Barber and Shampoo	2.0
Cup	0.5
Flushing Rim	7.0
Kitchen and Food Preparation per Faucet	3.0
Laboratory	1.5
Medical Exam and Treatment	1.5
Service	3.0
Surgeon Washup	2.0
Urinal:	
Syphon Jet	4.0
Washdown	2.0
Wall Hydrant, Hot and Cold Mix:	
1/2" diameter	3.0
3/4" diameter	4.0
Wash Fountain:	
Semicircular	2.0
Circular	3.0
Water Closet:	
Flushometer Type	7.0
Gravity Type Flush Tank	3.0

[a] For fixtures not listed, factors may be assumed by comparing the fixture to a listed fixture which uses water in similar quantities and at similar rates.

[b] Load Factors in gallons per minute, based on manufacturer's requirements.

Table 2 – State Water Fixture Units – Public
(taken from Comm 82.40)

CONVERSION OF WATER SUPPLY FIXTURES UNITS TO GALLONS PER MINUTE

WATER SUPPLY FIXTURE UNITS (WSFU)	GALLONS PER MINUTE	
	Predominately Flushometer Type Water Closets or Syphon Jet Urinals	Predominately Flush Tank Type Water Closets or Washdown Urinals
1	-	1
2	-	2
3	-	3
4	10	4
5	15	4.5
6	18	5
7	21	6
8	24	6.5
9	26	7
10	27	8
20	35	14
30	40	20
40	46	24
50	51	28
60	54	32
70	58	35
80	62	38
90	65	41
100	68	42
120	73	48
140	78	53
160	83	57
180	87	61
200	92	65
250	101	75
300	110	85
400	126	105
500	142	125
600	157	143
700	170	161
800	183	178
900	197	195
1000	208	208
1250	240	240
1500	267	267
1750	294	294
2000	321	321
2250	348	348
2500	375	375
2750	402	402
3000	432	432
4000	525	525
5000	593	593

Note: Value not specified in the table may be calculated by interpolation.
Fire sprinklers per head add 22 GPM to total.

Table 3 – Conversion Of Water Supply Fixture Units To Gallons Per Minute
(taken from Comm 82.40)

Pipe and Meter Size

ESTIMATED FLOW	Acceptable Minimum Water Service Piping			
	Up to 100'		Over 100'	
GPM	Piping	Meter	Piping	Meter
0-12	1"	5/8"	1"	5/8"
	1"	5/8"	1"	5/8"
13-15	1"	5/8"	1"	5/8"
	1"	¾"	1-1/2"	¾"
16-20	1"	¾"	1-1/2"	¾"
	1-1/2"	¾'	1-1/2"	¾"
21-25	1-1/2"	¾"	1-1/2"	¾"
	1-1/2"	1"	1-1/2"	1"
26-30	1-1/2"	1"	1-1/2"	1"
	1-1/2"	1"	1-1/2"	1"
31-40	1-1/2"	1"	1-1/2"	1"
	1-1/2"	1"	1-1/2"	1"
41-50	1-1/2"	1"	1-1/2"	1"
	1-1/2"	1-1/2"	2"	1-1/2"
51-60	1-1/2"	1-1/2"	2"	1-1/2"
	1-1/2"	1-1/2"	2"	1-1/2"
61-70	2"	1-1/2"	2"	1-1/2"
	2"	1-1/2"	2"	1-1/2"
71-85	2"	1-1/2"	2"	1-1/2"
	2"	2"	2"	2"
86-100	2"	2"	3"	2"
	2"	2"	3"	2"
101-120	3"	2"	3"	2"
	3"	2"	3"	2"
121-140	3"	2"	3"	2"
	3"	3"	3"	3"
141-160	3"	3"	3"	3"
	3"	3"	3"	3"
161-180	3"	3"	4"	3"
	3"	3"	4"	3"
181-200	3"	3"	4"	3"
	3"	3"	4"	3"
201-250	3"	3"	4"	3"
	3"	3"	4"	3"
251-300	4"	4"	4"	4"
	4"	4"	4"	4"
301-400	4"	4"	6"	4"
	4"	4"	6"	4"

Notes:

1. The plumber is responsible for final verification of service pipe sizing due to related pressure losses.
2. 2" and larger meters, type is specified at time of application based on application.

Table 4 - Pipe and Meter Size

Pipe and Meter Size - Over 500 GPM

ESTIMATED FLOW		Acceptable Minimum Water Service Piping			
		Up to 100'		Over 100'	
Intermittent	Constant				
GPM	GPM	Piping	Meter	Piping	Meter
800	500	6"	6"	8"	6"
1000	800	8"	8"	8"	8"
1800	1500	8"	8"	10"	8"
2500	2000	10"	10"	10"	10"
Over 2500	Over 2000	All flows exceeding 2500 GPM intermittent flow or 2000 GPM constant flow will be approved and sized based on data submitted with application.			

Notes:

1. The plumber is responsible for final verification of service pipe sizing due to related pressure losses.

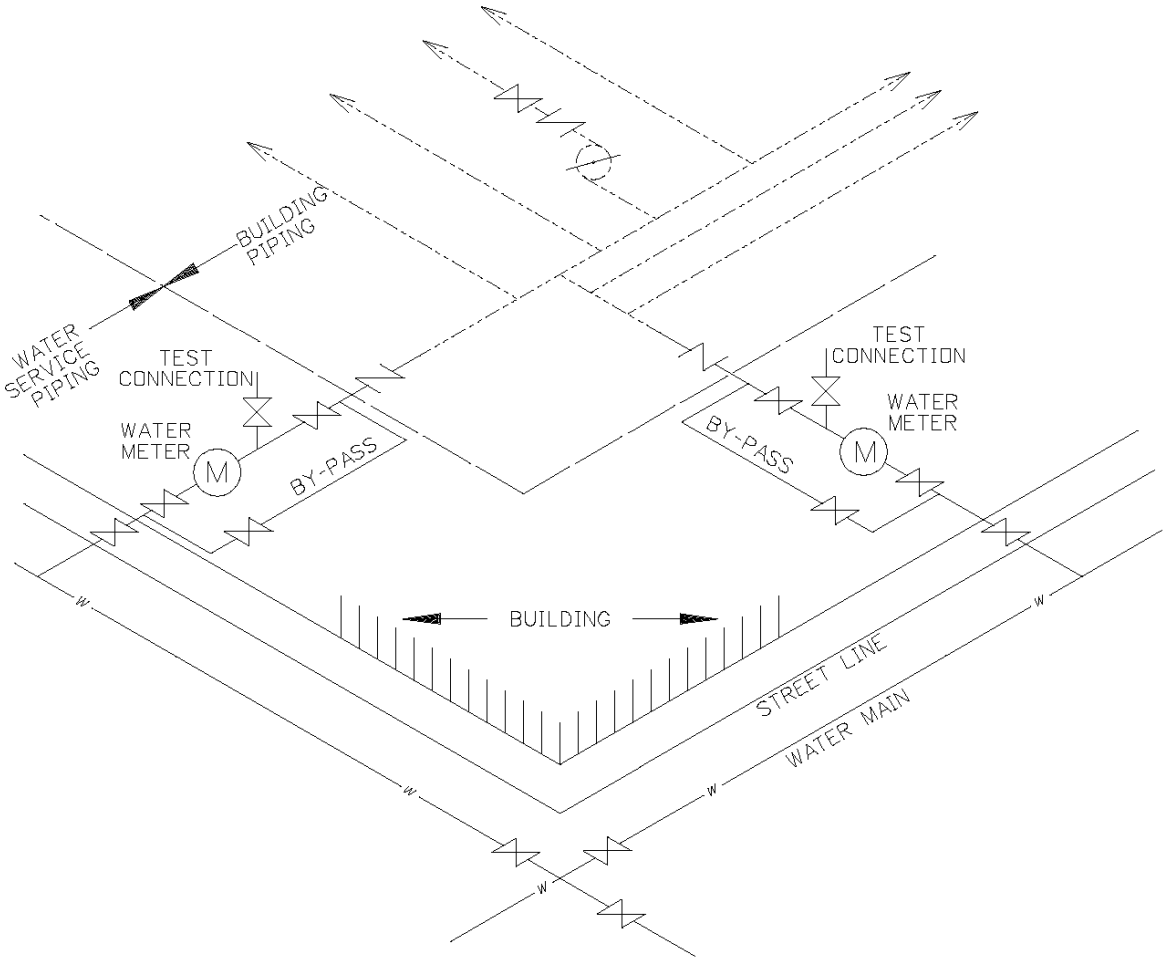
Table 5 - Pipe and Meter Size - Over 500 GPM

Drawings
Section 4.2.0

4.2.1 Water Specification Drawings

Drawing No.	Description
1.	Dual Domestic Metering
2.	Domestic and Fire (Dual Service Option)
3.	Domestic and Fire - Separate Laterals
4.	Domestic with Full Flow Fire Meter
5.	Domestic and Fire - Combined Lateral
6.	Residential Fire Protection with Domestic Metering
7.	Tunnel Dimensions for Tap and Branch Service Piping
8.	Trench Dimensions for Branch Service Piping
9.	Branch Service Piping
10.	Tap Trench Dimensions
11.	Tap Service Piping
12.	Water Service Insulation - Perlite and Rigid Insulation
13.	Meter Setting - Basement Type - ⅝", ¾" and 1" Meters
14.	Manifold Setting for ⅝", ¾", and 1" Meters
15.	Meter Setting - Well Type ⅝", ¾", and 1" Meters
16.	Meter Setting - Basement Type - 1½" and 2" Meters
17.	Meter Setting - Well Type - 1½" and 2" Meters
18.	Meter Setting - Well Type - ⅝", ¾" and 1" Meter - Lawn Sprinklers
19.	Meter Setting - Well Type - 1½" Meter - Lawn Sprinklers

20.	Meter Setting - Well Type - 2" Meter - Lawn Sprinklers
21.	Meter Setting - Basement Type - 2, 3, 4, 6, 8 and 10" Meters
21N.	Notes - Meter Setting - Basement Type - 2, 3, 4, 6, 8 and 10" Meters
22.	Meter Setting - Pit Type - 2, 3, 4, 6, 8 and 10" Meters
22N.	Notes - Meter Setting - Pit Type - 2, 3, 4, 6, 8 and 10" Meters
23.	Double Detector Check - No Domestic Tee - Basement Setting
24.	Vertical Double Detector Check - No Domestic Tee - Basement Setting
25.	Double Detector Check - No Domestic Tee - Pit Setting
26.	Combined Fire/Domestic in a Pit - 1½" or 2" Domestic
26N.	Notes - Combined Fire/Domestic in a Pit - 1½" or 2" Domestic
27.	Combined Fire/Domestic in a Pit - 3" or Larger Domestic
27N.	Notes - Combined Fire/Domestic in a Pit - 3" or Larger Domestic
28.	Meter Setting - Full Flow Fire Meter in a Pit
28N.	Notes - Meter Setting - Full Flow Fire Meter in a Pit
29.	Water Service Through a Wall/Floor
30.	Anchorage Details
30A.	Megalug Anchorage Details
31.	Strapping Details
32.	Meter Test or Emergency Connection Discharge on Building



GATE VALVE

CHECK VALVE

WATER METER

BOOSTER PUMP

PLUMBING CODES

NOTES:

1) A CHECK VALVE IS REQUIRED IN EACH METER AND BOOSTER PUMP DISCHARGE.

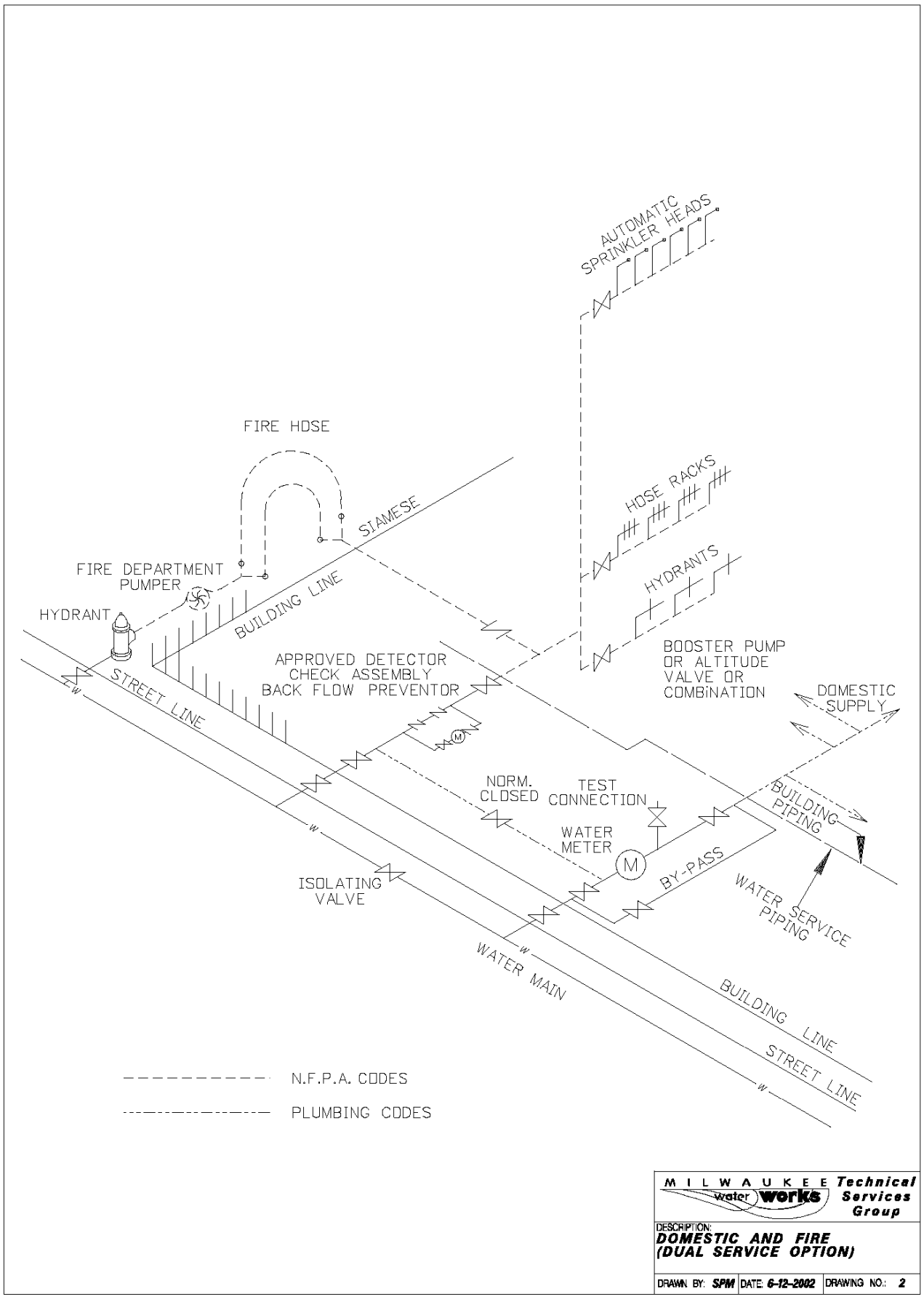
2) BY-PASS PIPING ON CROSS CONNECTED DOMESTIC SERVICES IS OPTIONAL

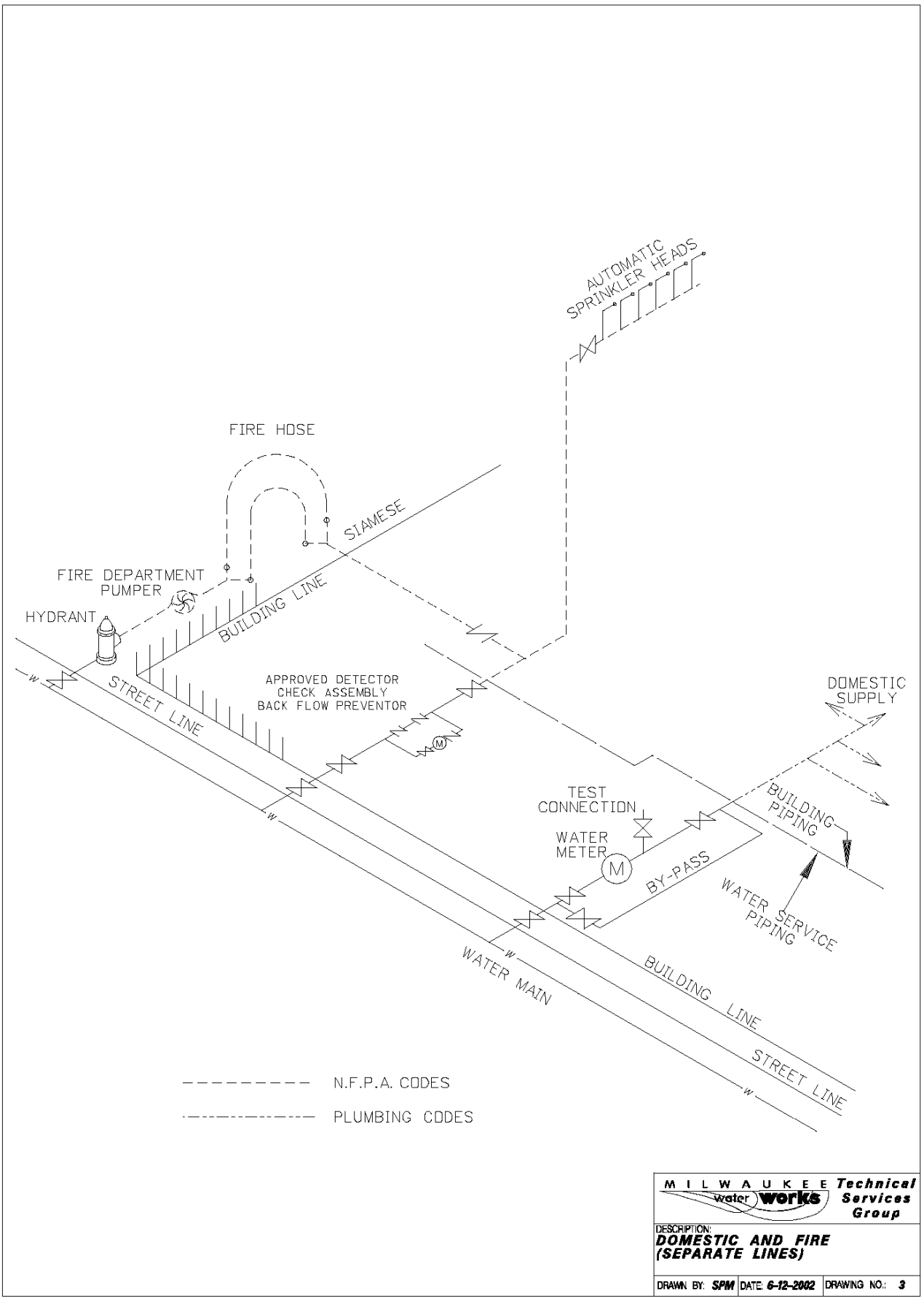
MILWAUKEE water works Technical Services Group

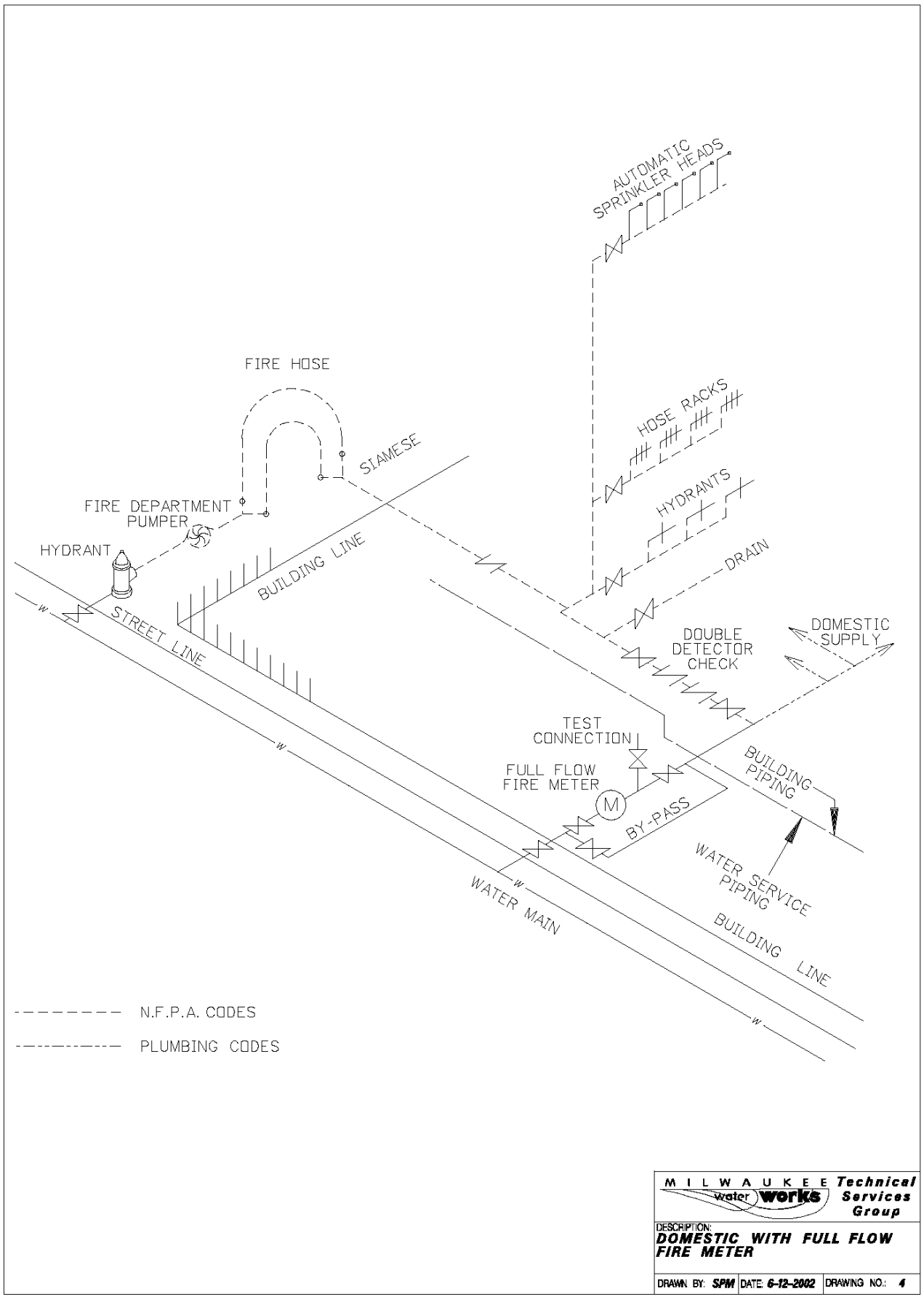
DESCRIPTION:

DUAL DOMESTIC METERING

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 1


AUTOMATIC SPRINKLER HEADS
FIRE HDSE
HOSE RACKS
SIAMESE
HYDRANTS
FIRE DEPARTMENT PUMPER
BUILDING LINE
HYDRANT
BOOSTER PUMP OR ALTITUDE VALVE OR COMBINATION
APPROVED DETECTOR CHECK ASSEMBLY BACK FLOW PREVENTOR
DOMESTIC SUPPLY
STREET LINE
NORM. CLOSED
TEST CONNECTION
BUILDING PIPING
WATER METER
BY-PASS
ISOLATING VALVE
WATER SERVICE PIPING
WATER MAIN
BUILDING LINE
STREET LINE
N.F.P.A. CODES
PLUMBING CODES
MILWAUKEE water works
Technical Services Group
DESCRIPTION:
DOMESTIC AND FIRE (DUAL SERVICE OPTION)
DRAWN BY: SPM
DATE: 6-12-2002
DRAWING NO.: 2

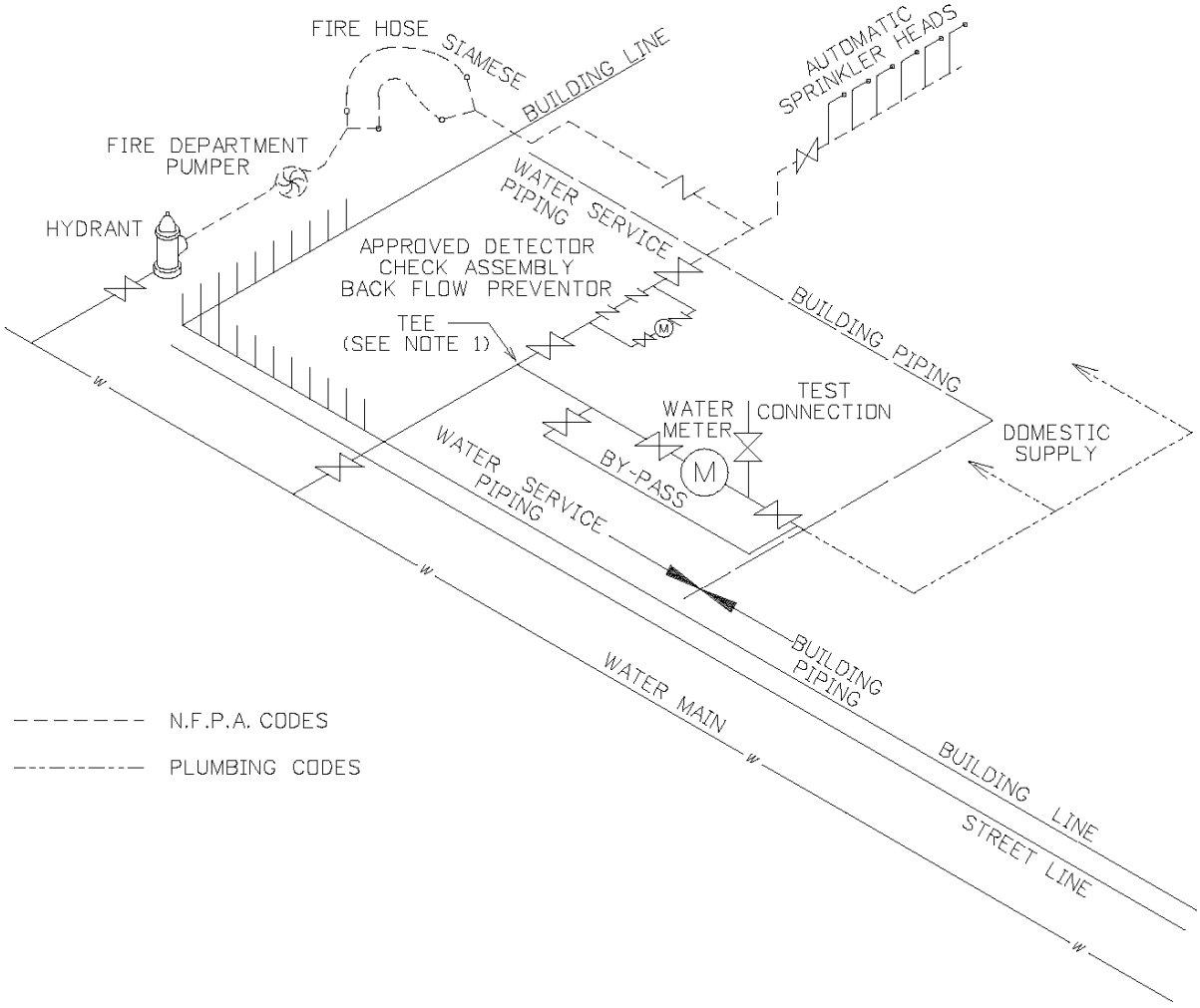

AUTOMATIC SPRINKLER HEADS
FIRE HOSE
SIAMESE
FIRE DEPARTMENT PUMPER
HYDRANT
BUILDING LINE
STREET LINE
APPROVED DETECTOR CHECK ASSEMBLY BACK FLOW PREVENTOR
DOMESTIC SUPPLY
TEST CONNECTION
WATER METER
BY-PASS
BUILDING PIPING
WATER SERVICE PIPING
WATER MAIN
BUILDING LINE
STREET LINE
N.F.P.A. CODES
PLUMBING CODES
MILWAUKEE water works
Technical Services Group
DESCRIPTION:
DOMESTIC AND FIRE (SEPARATE LINES)
DRAWN BY: SPM
DATE: 6-12-2002
DRAWING NO.: 3



MILWAUKEE water works Technical Services Group

DESCRIPTION:
DOMESTIC WITH FULL FLOW FIRE METER

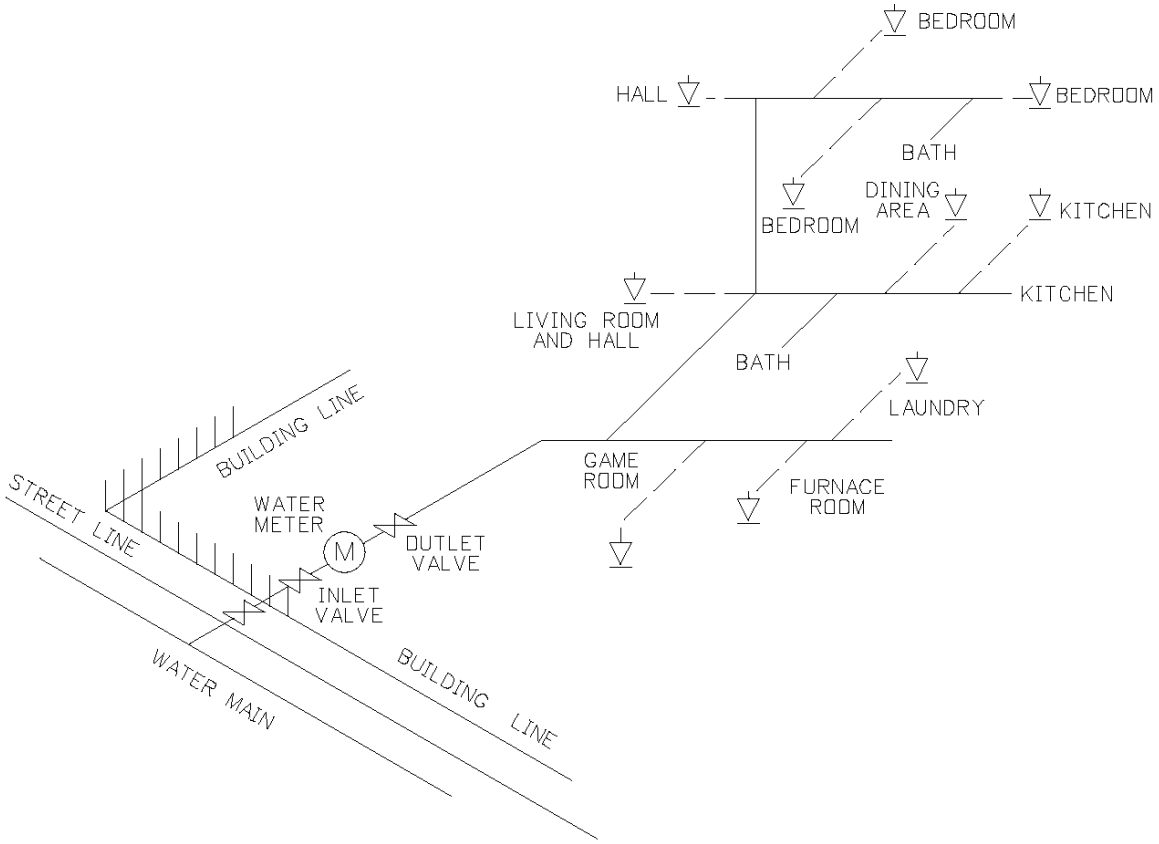
DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 4



MILWAUKEE water works Technical Services Group

DESCRIPTION:
DOMESTIC AND FIRE (COMBINED LATERAL)

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 5



NOTES:

1 ADD DOMESTIC DESIGN DEMAND AND SPRINKLER DEMAND TO DETERMINE THE SIZE OF THE WATER SERVICE PIPING AND WATER METER. EXCEPTION: DOMESTIC DESIGN DEMAND SHALL NOT BE REQUIRED TO BE ADDED WHERE PROVISION IS MADE TO PREVENT FLOW INTO THE DOMESTIC WATER SYSTEM UPON OPERATION OF A SPRINKLER, IN WHICH CASE THE LARGER DEMAND SHALL BE USED FOR SIZING.

2 FLOW CHARACTERISTICS OF THE WATER METER SHALL BE INCLUDED IN THE HYDRAULIC CALCULATION OF THE SYSTEM.

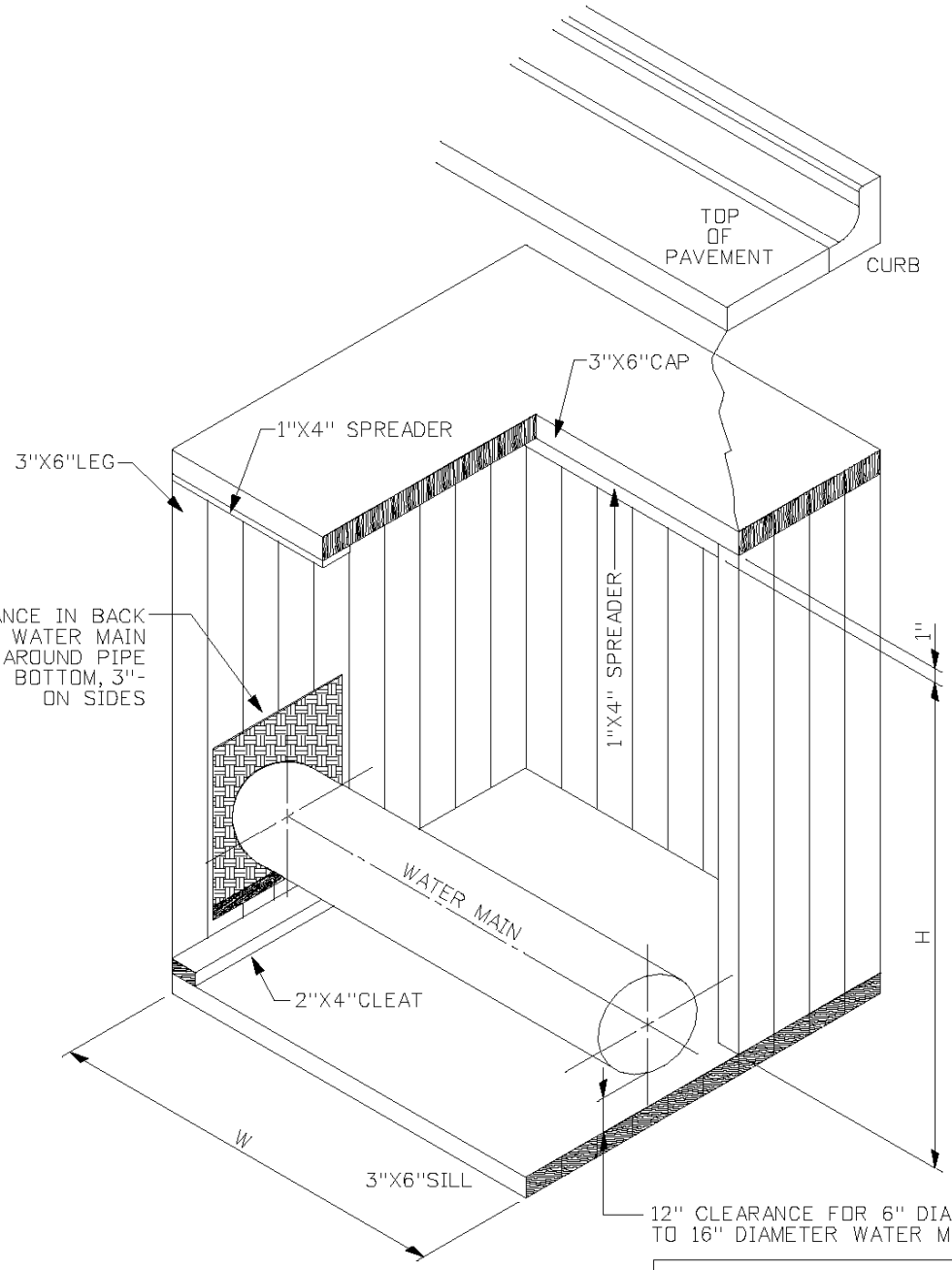
3 MINIMUM WATER METER SHALL BE 3/4."

4 SEE DRAWINGS 13 & 16 FOR APPROVED METER SETTING CONFIGURATIONS.

MILWAUKEE water works Technical Services Group

DESCRIPTION:
RESIDENTIAL FIRE PROTECTION WITH DOMESTIC METERING

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 6



W	5'-0" FOR ALL BRANCHES
H	6'-0" FOR ALL WATER MAINS

NOTES:

1 TUNNEL TIMBERS TO BE MAPLE HEARTS.

2 TUNNEL TIMBERS TO REMAIN IN PLACE.

3 BACKFILL TUNNEL WITH 1 PART CEMENT TO 12 PARTS SAND; PLACED DRY AND TAMPED TO COMPLETELY FILL THE TUNNEL.

4 ADEQUATE LIGHTING SHALL BE PROVIDED BY CUSTOMER.

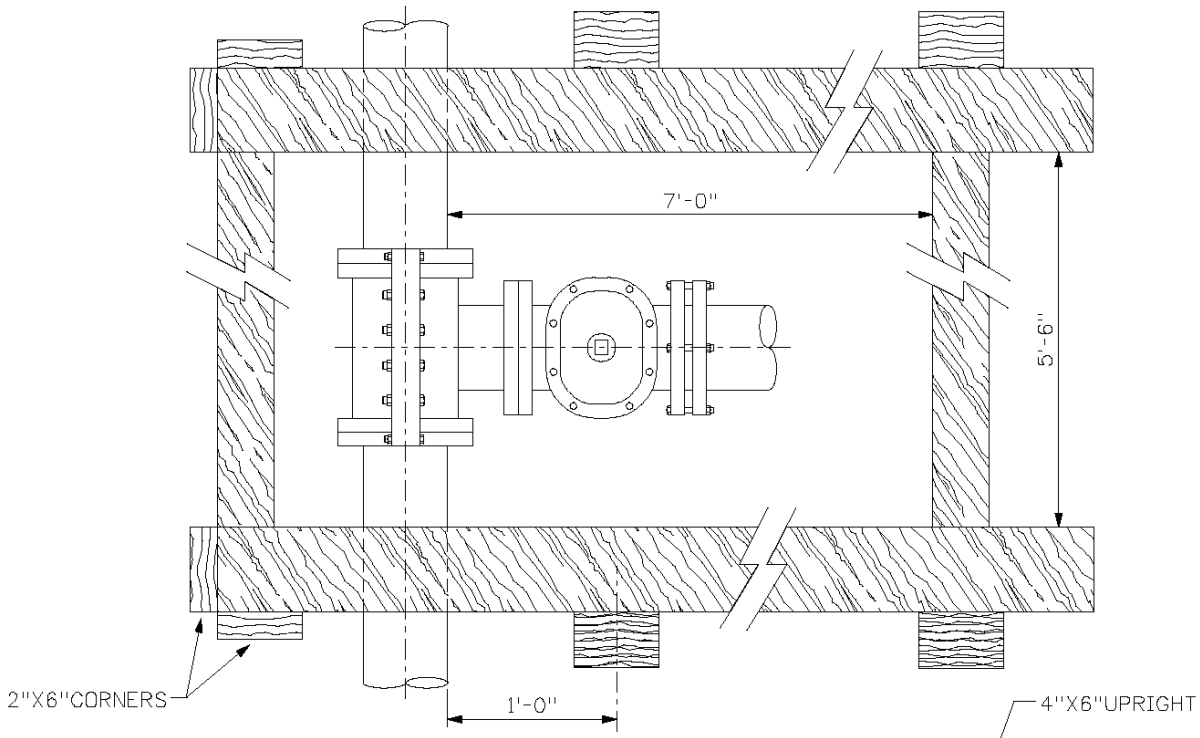
5 OSHA REGULATIONS SHALL GOVERN TRENCH BRACING, ETC. DIMENSIONS SHOWN HERE ARE MINIMUM CLEARANCES REQUIRED FOR ADEQUATE WORKING SPACE.

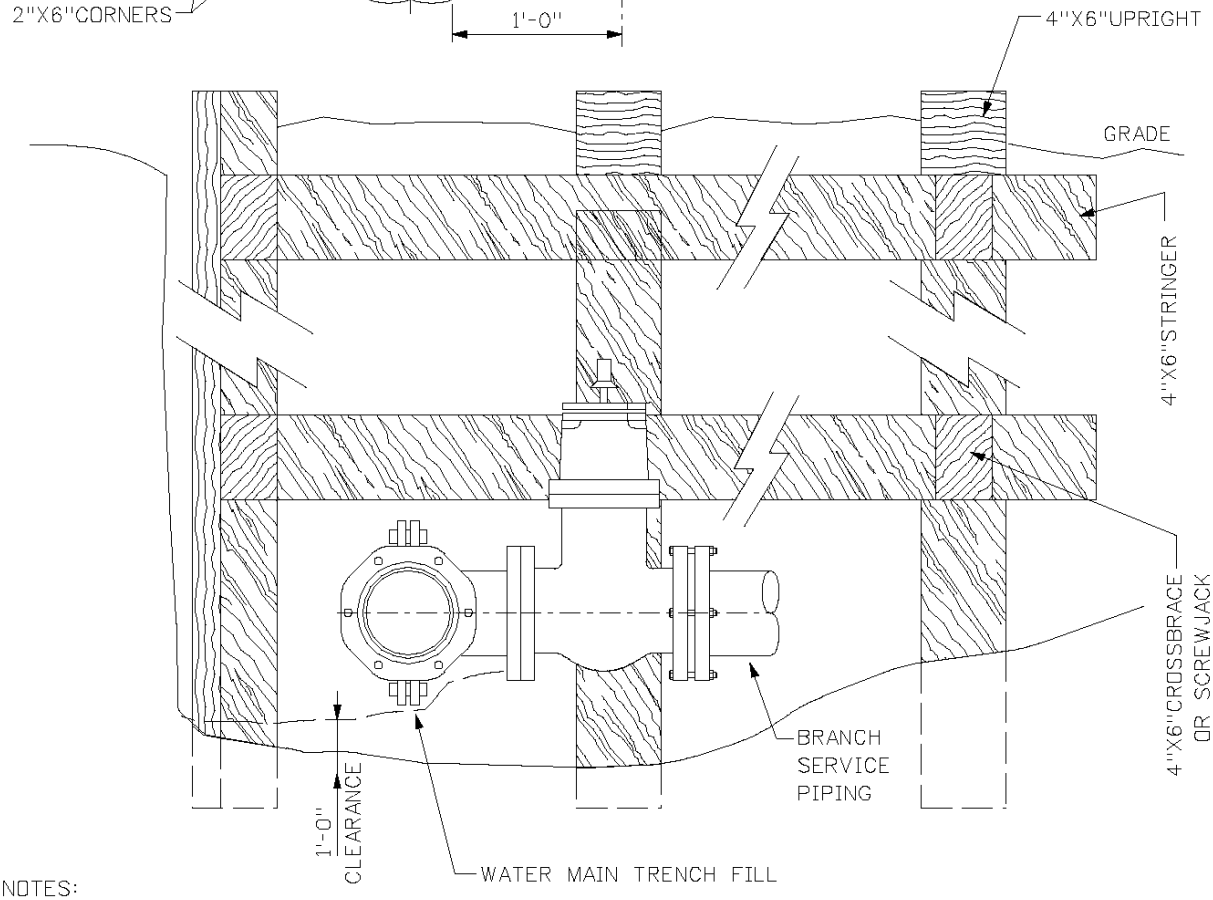
6 CONTRACTOR TO PLACE 6" MINIMUM LAYER OF LIMESTONE BEDDING CHIPS IN BOTTOM OF EXCAVATION

MILWAUKEE water works — Technical Services Group

DESCRIPTION:
TUNNEL DIMENSIONS FOR TAP AND BRANCH SERVICE PIPING

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 7





NOTES:

1 OSHA REGULATIONS SHALL GOVERN TRENCH BRACING, ETC. DIMENSIONS SHOWN HERE ARE MINIMUM CLEARANCES REQUIRED FOR ADEQUATE WORKING SPACE.

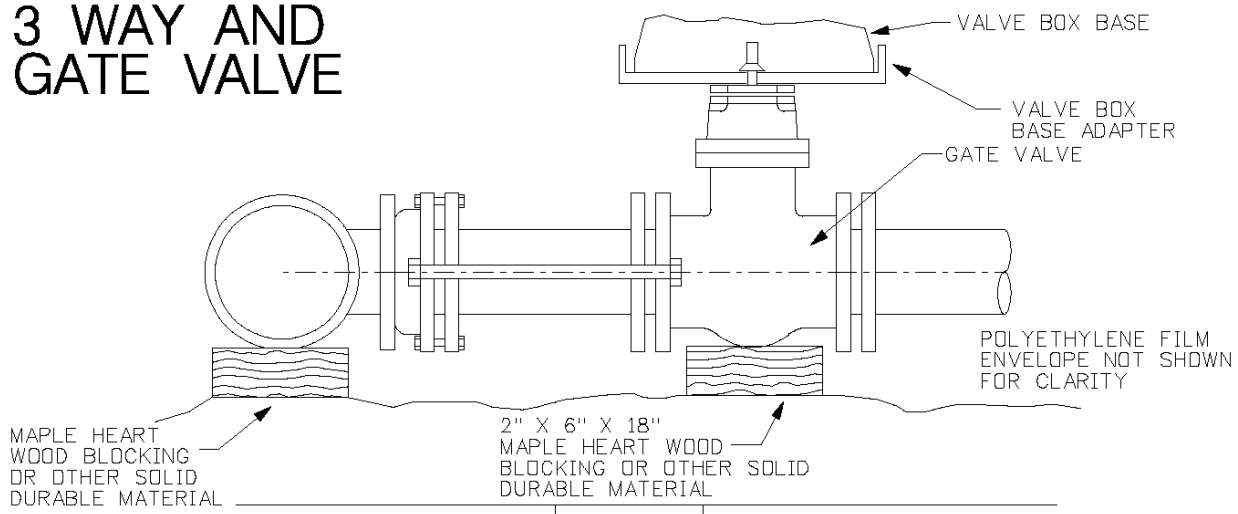
2 CONTRACTOR TO PLACE 6" MINIMUM LAYER OF LIMESTONE BEDDING CHIPS IN BOTTOM OF EXCAVATION

MILWAUKEE water works Technical Services Group

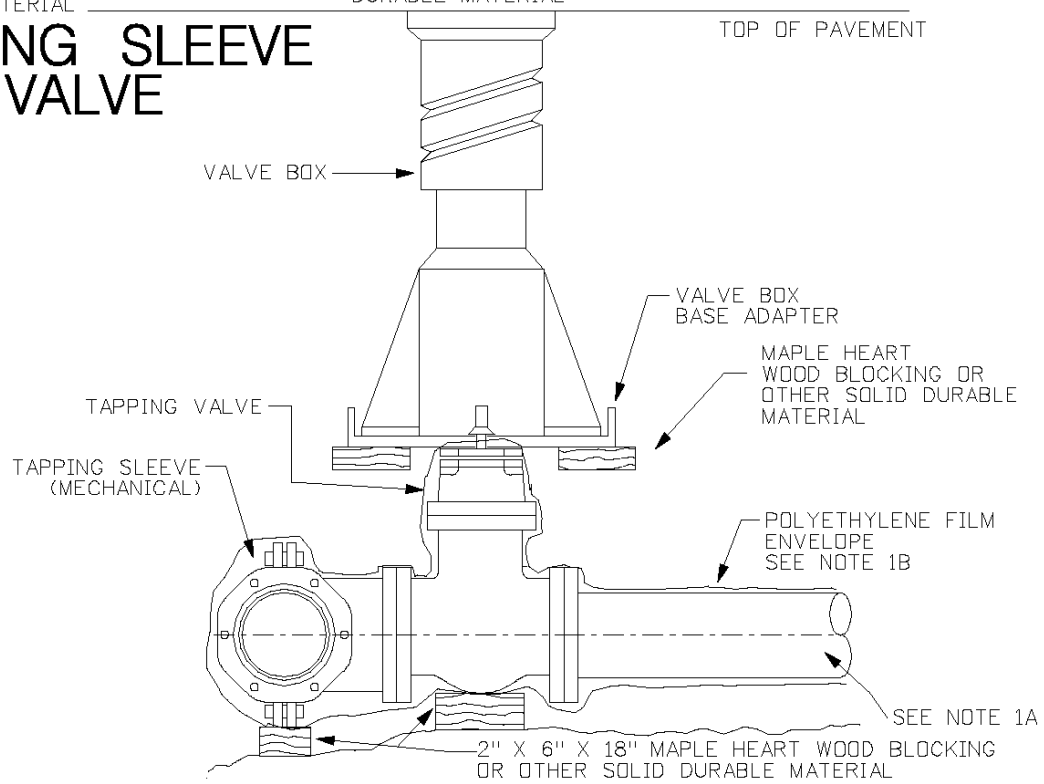
DESCRIPTION:
TRENCH DIMENSIONS FOR BRANCH SERVICE PIPING

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 8

3 WAY AND GATE VALVE



TAPPING SLEEVE AND VALVE



NOTES:

1 MATERIAL
   A) PIPE - DUCTILE IRON
   B) POLYETHYLENE FILM - POLYETHYLENE FILM ENVELOPE WHICH CONFORMS WITH MWW STANDARDS PER APPENDIX L

2 REFER TO CURRENT SPECIFICATION 5.15.11 (WATER MAIN INSTALL SPECS) FOR BRANCH INSTALLATION.

3 WATER SERVICE PIPING SHALL BE 6'-0" MIN. BELOW GRADE AND BE LEVEL WITH THE WATER MAIN.

4 WHERE AVAILABLE, ANCHOR TEES ARE PERMITTED.

5 COMM 82.40(8)(b) SHALL GOVERN ACCEPTABLE DISTANCES BETWEEN ANY SANITARY SEWER AND WATER SERVICE PIPING.

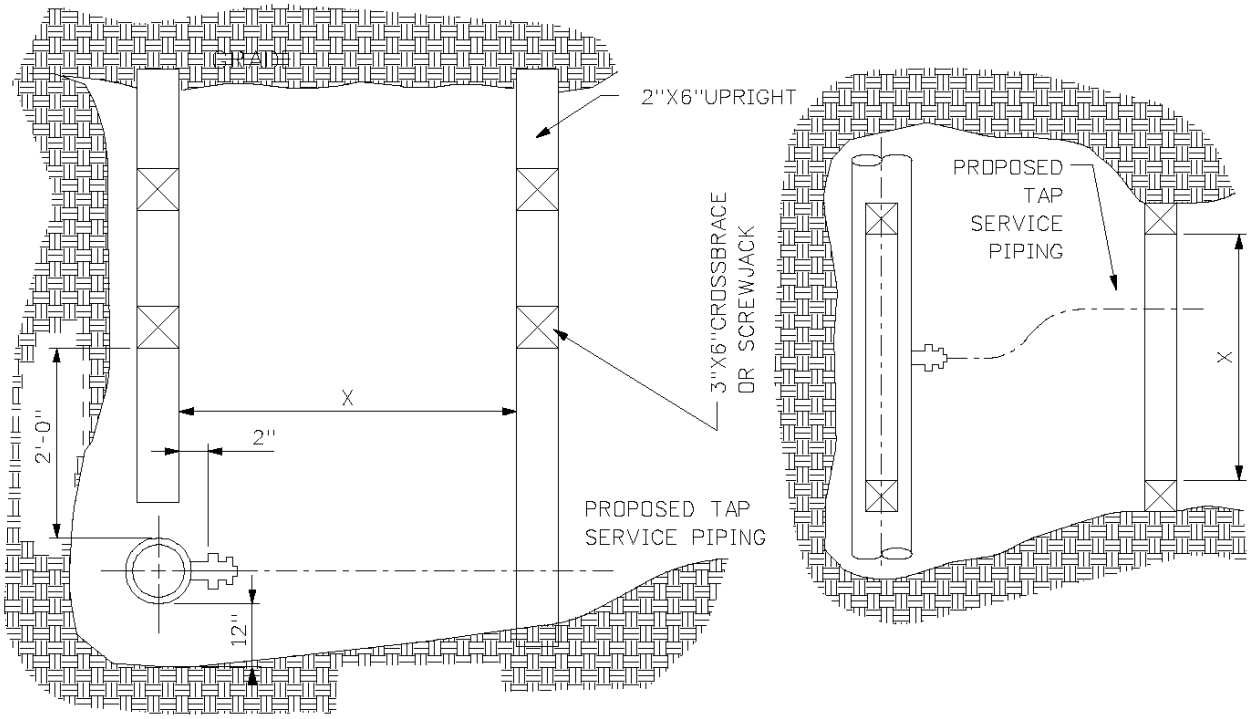
6 VALVE STOP BOXES SHALL BE A MAXIMUM OF 1" ABOVE FINISHED GRADE AND SHALL BE ACCESSIBLE IN UNPAVED AREAS

7 VALVE STOP BOXES SHALL BE FLUSH WITH THE FINISHED GRADE IN PAVED AREAS

MILWAUKEE water works Technical Services Group

DESCRIPTION: **BRANCH SERVICE PIPING**

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 9



X	TAP SIZE
4'-0"	1"
5'-0"	1½"
5'-0"	2"

NOTES:

1 OSHA REGULATIONS SHALL GOVERN TRENCH BRACING, ETC. DIMENSIONS SHOWN HERE ARE MINIMUM CLEARANCES REQUIRED FOR ADEQUATE WORKING SPACE.

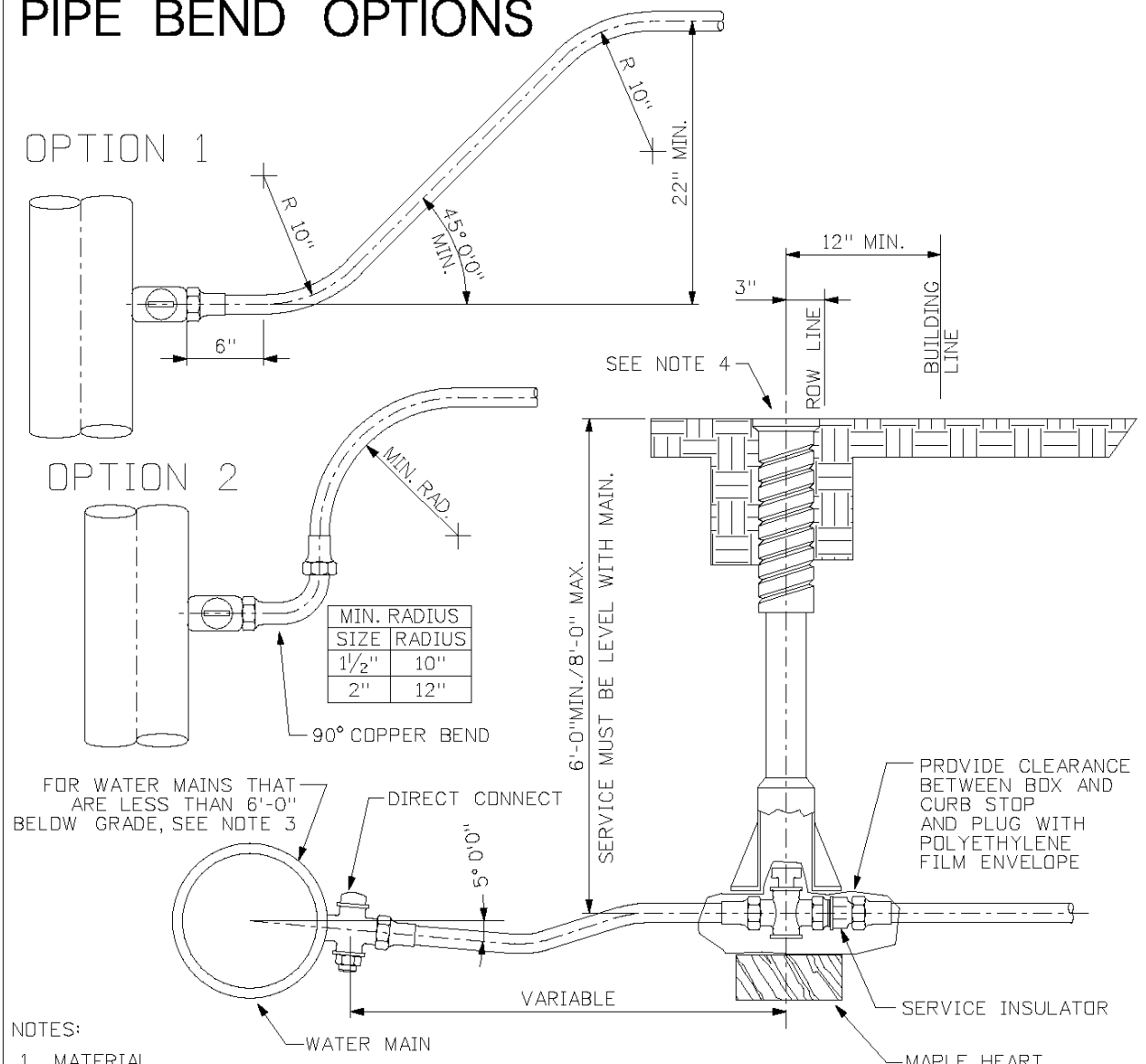
2 CONTRACTOR TO PLACE 6" MINIMUM LAYER OF LIMESTONE BEDDING CHIPS IN BOTTOM OF EXCAVATION

MILWAUKEE water works Technical Services Group

DESCRIPTION:
TAP TRENCH DIMENSIONS

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 10

PIPE BEND OPTIONS



MIN. RADIUS	
SIZE	RADIUS
1½"	10"
2"	12"

NOTES:

1 MATERIAL
A) COPPER TUBE - TYPE K

2 COPPER SERVICE INCLUDING CORPORATION STOPS, SHALL BE COVERED WITH A POLYETHYLENE FILM ENVELOPE. THE COVERING IS TO EXTEND FOR A DISTANCE OF 6'-0" ALONG THE SERVICE FROM THE MAIN. SEE APPENDIX L

3 WHEN THE WATER MAIN AND CORPORATION STOP ARE LESS THAN 6'-0" BELOW FINAL GRADE, THE PIPE SHALL DECLINE TO A 6'-0" DEPTH IN A DISTANCE OF 2'-0". THAT PART OF THE SERVICE AND WATER MAIN THAT IS LESS THAN 6'-0" BELOW GRADE SHALL BE INSULATED AS PER DRAWING 12.

4 CURB STOP SHALL NOT BE WITHIN THE SIDEWALK. CONSULT THE UTILITY FOR ALTERNATIVES.

5 CDMM 82.40(8)(b) SHALL GOVERN ACCEPTABLE DISTANCES BETWEEN ANY SANITARY SEWER AND WATER SERVICE PIPING.

6 VALVE STOP BOXES SHALL BE A MAXIMUM ON 1" ABOVE FINISHED GRADE AND SHALL BE ACCESSIBLE IN UNPAVED AREAS.

7 VALVE STOP BOXES SHALL BE FLUSH WITH THE FINISHED GRADE IN PAVED AREAS.

8 ON EACH C.D.S. OR INSTALLATION OF NEW SERVICE, THE CONTRACTOR SHALL FURNISH AND INSTALL A SERVICE INSULATOR (FORD METER BOX CO. SI-2, -4, -6, -7 OR EQUAL)

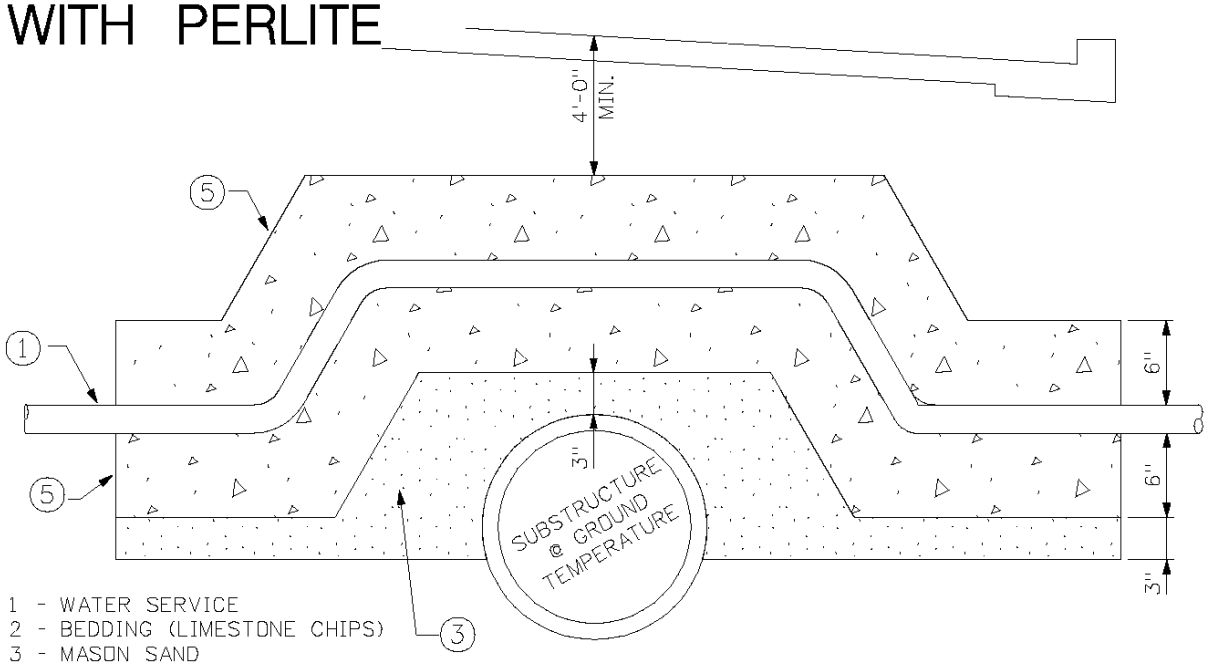
SERVICE SIZE	SERVICE BOX
1"	2½"
1½"	3"
2"	3"

MILWAUKEE water works Technical Services Group

DESCRIPTION: **TAP SERVICE PIPING**

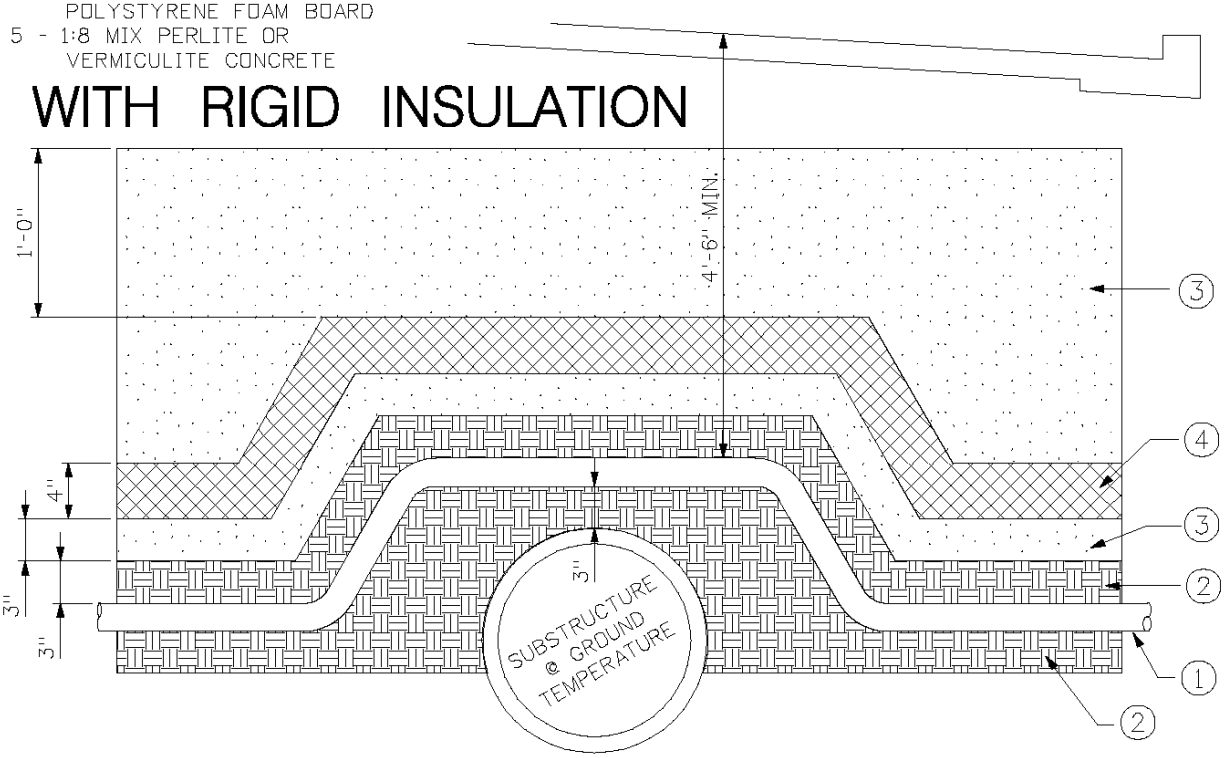
DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 11

WITH PERLITE



1 - WATER SERVICE
2 - BEDDING (LIMESTONE CHIPS)
3 - MASON SAND
4 - CLOSED CELL EXTRUDED POLYSTYRENE FOAM BOARD
5 - 1:8 MIX PERLITE OR VERMICULITE CONCRETE

WITH RIGID INSULATION



NOTES:

1 IN ANY CASE WHICH THE 6'-0" MINIMUM DEPTH CANNOT BE MAINTAINED, OR WHERE THERE IS DANGER OF THE WATER SERVICE PIPING FREEZING DUE TO FROST PENETRATION, PLACEMENT SHALL BE BENEATH SUBSTRUCTURE.

2 AN ADDITIONAL TWO INCHES OF INSULATION IS REQUIRED UNDER STREETS, PARKING LOTS, AND RAILROAD TRACKS. HAND PLACE FOUR INCHES TO SIX INCHES OF BACKFILL OVER THE INSULATION.

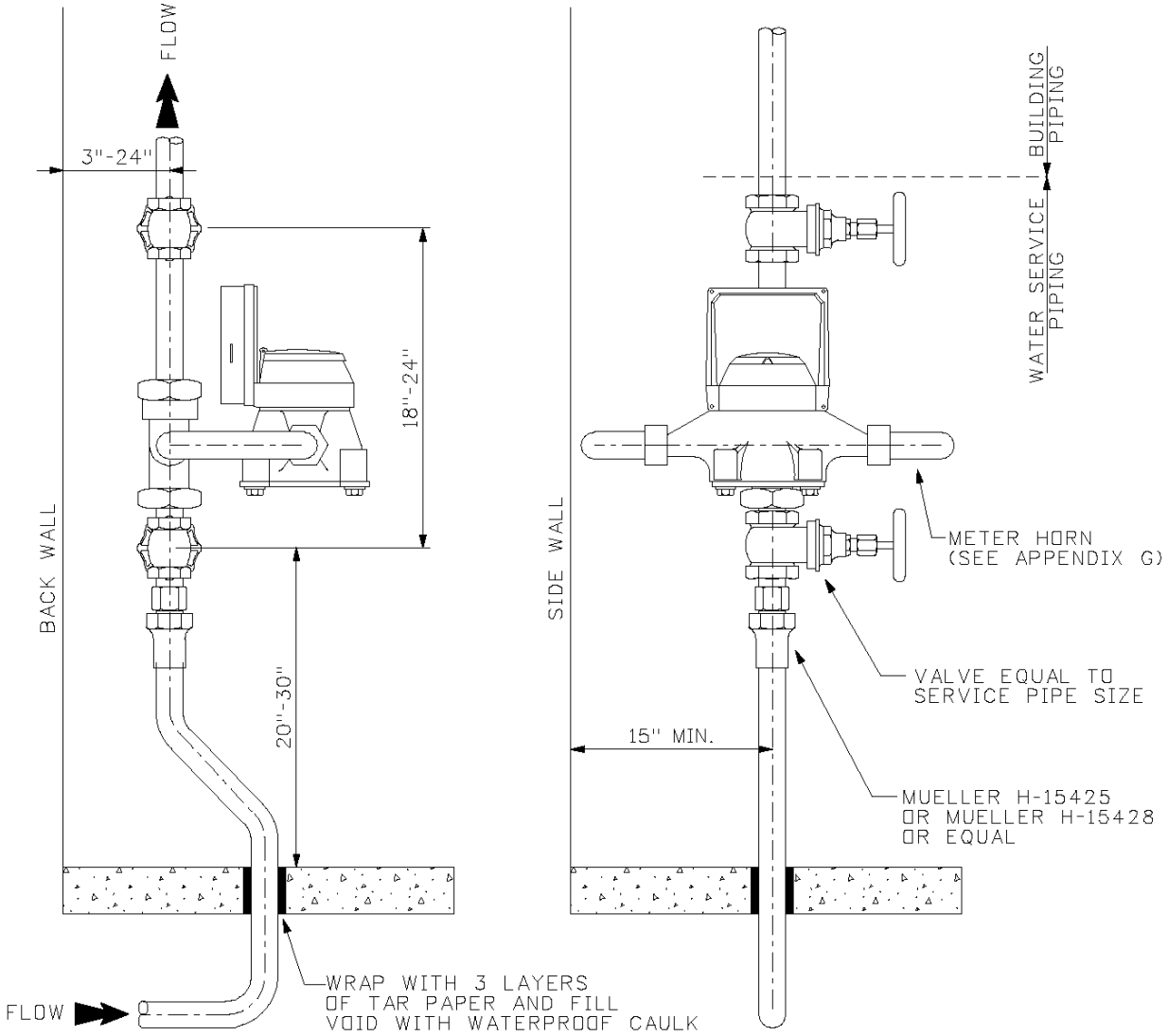
3 INSULATION TO EXTEND 1'-0" MINIMUM BEYOND OUTER BENDS IN WATER SERVICE PIPING.

4 WATER SERVICES 3" OR LARGER THAT CROSS OVER A SANITARY SEWER SHALL BE INSTALLED AND SLEEVED PER COMM 82.40(8)(b)(4).

MILWAUKEE water works Technical Services Group

DESCRIPTION:
WATER SERVICE INSULATION
PERLITE & RIGID INSULATION

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 12



NOTES:

1 MATERIALS:
A) ALL NIPPLES, FITTINGS, AND CONNECTIONS: BRASS OR SWEATED COPPER TYPE - K OR L
B) WATER SERVICE PIPE: TYPE - K COPPER

2 SERVICE PIPE ENTRY TO BE WATERPROOF.

3 SOLDER JOINTS PROHIBITED ON ALL UNDERGROUND WATER SERVICE PIPING.

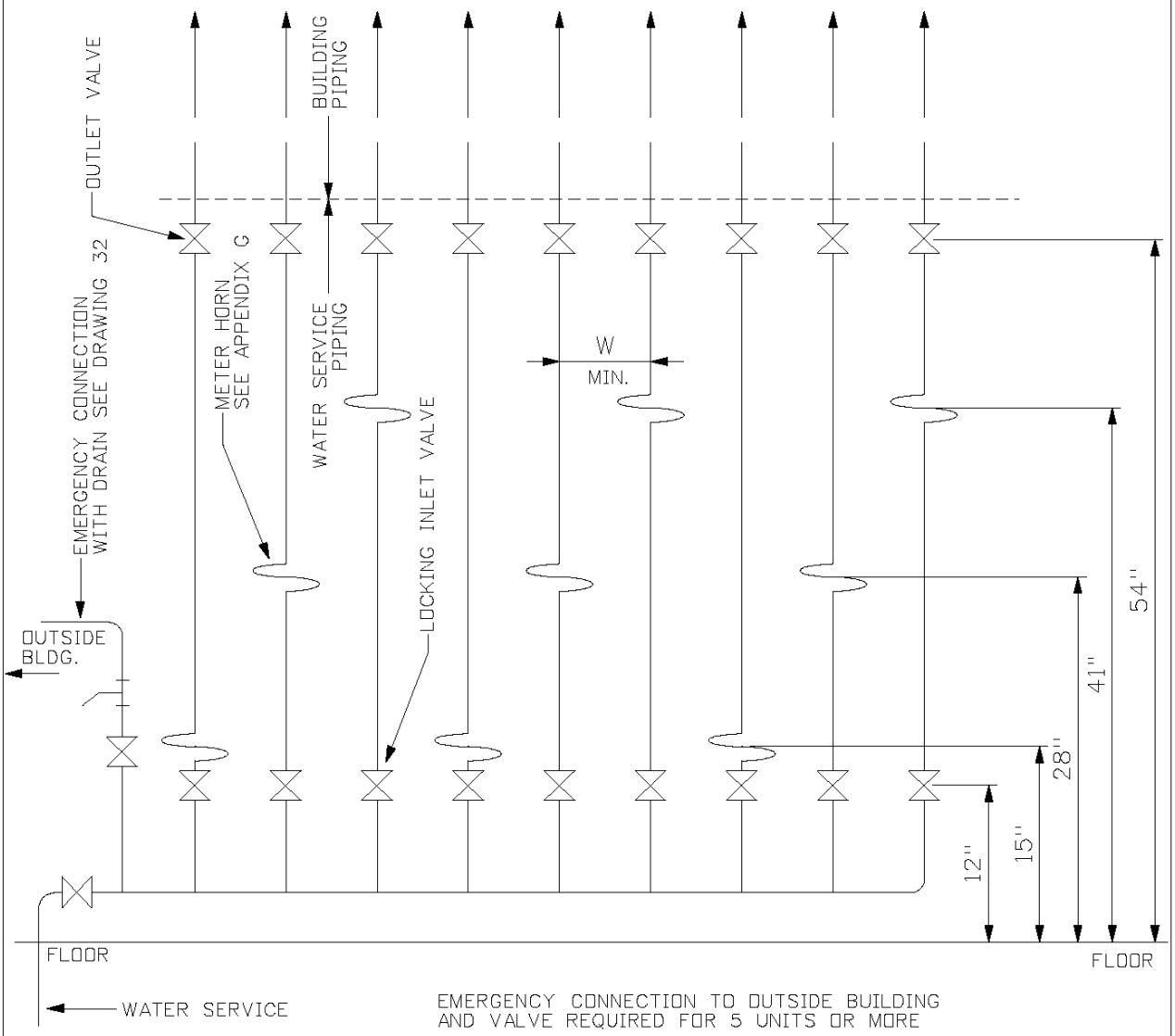
4 SEE APPENDIX D AND E FOR VALVES.

5 RISER PIPING SHALL BE RIGIDLY SUPPORTED TO BACK WALL.

MILWAUKEE water works — Technical Services Group

DESCRIPTION:
METER SETTING
BASEMENT TYPE
5/8", 3/4", 1" METERS

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 13



NOTES:

1 MATERIALS:
   A) ALL NIPPLES, FITTINGS, AND CONNECTIONS: BRASS OR SWEAT COPPER TYPE - K OR L
   B) PIPE: TYPE - K OR L COPPER

2 SEE APPENDIX D AND E FOR VALVES

3 SERVICE PIPE ENTRY TO BE WATERPROOF.

4 SOLDER JOINTS PROHIBITED ON ALL UNDERGROUND WATER SERVICE PIPING.

5 ATTACH METAL TAG TO EACH METER HORN IDENTIFYING THE ADDRESS/UNIT SERVED.

6 PROVIDE ADEQUATE SUPPORT ALONG THE LENGTH OF MANIFOLD INSTALLATION.

7 A FLOOR DRAIN IN THE METER ROOM IS RECOMMENDED

8 TEE IN-LINE AFTER INLET VALVE AND BEFORE THE FIRST METER HORN EMERGENCY HOSE CONNECTION WITH A DRAIN VALVE. SIZE EQUAL TO SERVICE PIPE SIZE.

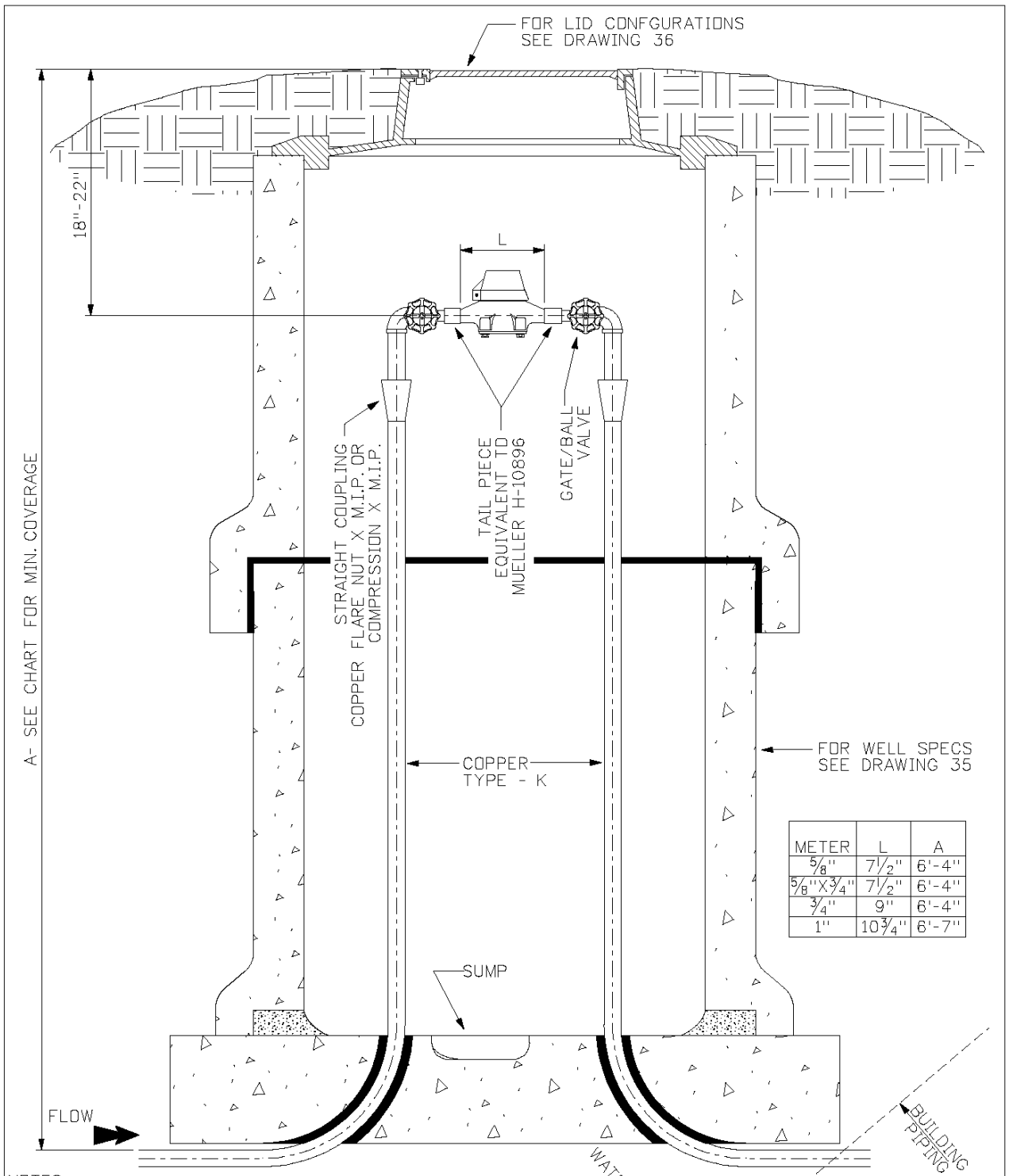
9 EMERGENCY CONNECTION SHALL BE TERMINATED ON AN OUTSIDE WALL AS SHOWN IN DRAWING 32. LOCATION OF EMERGENCY CONNECTION ON EXTERIOR OF BUILDING IS AT OWNER'S DISCRETION, BUT SHALL FACILITATE THE CONNECTION.

METER	W
5/8"	7"
3/4"	12"
1"	12"

MILWAUKEE water works Technical Services Group

DESCRIPTION: **MANIFOLD SETTING FOR 5/8", 3/4", 1" METERS**

DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 14



METER	L	A
5/8"	7 1/2"	6'-4"
5/8"X3/4"	7 1/2"	6'-4"
3/4"	9"	6'-4"
1"	10 3/4"	6'-7"

NOTES:

1 MATERIALS:
A) ALL NIPPLES, FITTINGS, AND CONNECTIONS: BRASS
B) PIPE: TYPE - K COPPER

2 SERVICE PIPE ENTRY TO BE WATERPROOF.

3 SOLDER JOINTS PROHIBITED ON ALL UNDERGROUND WATER SERVICE PIPING

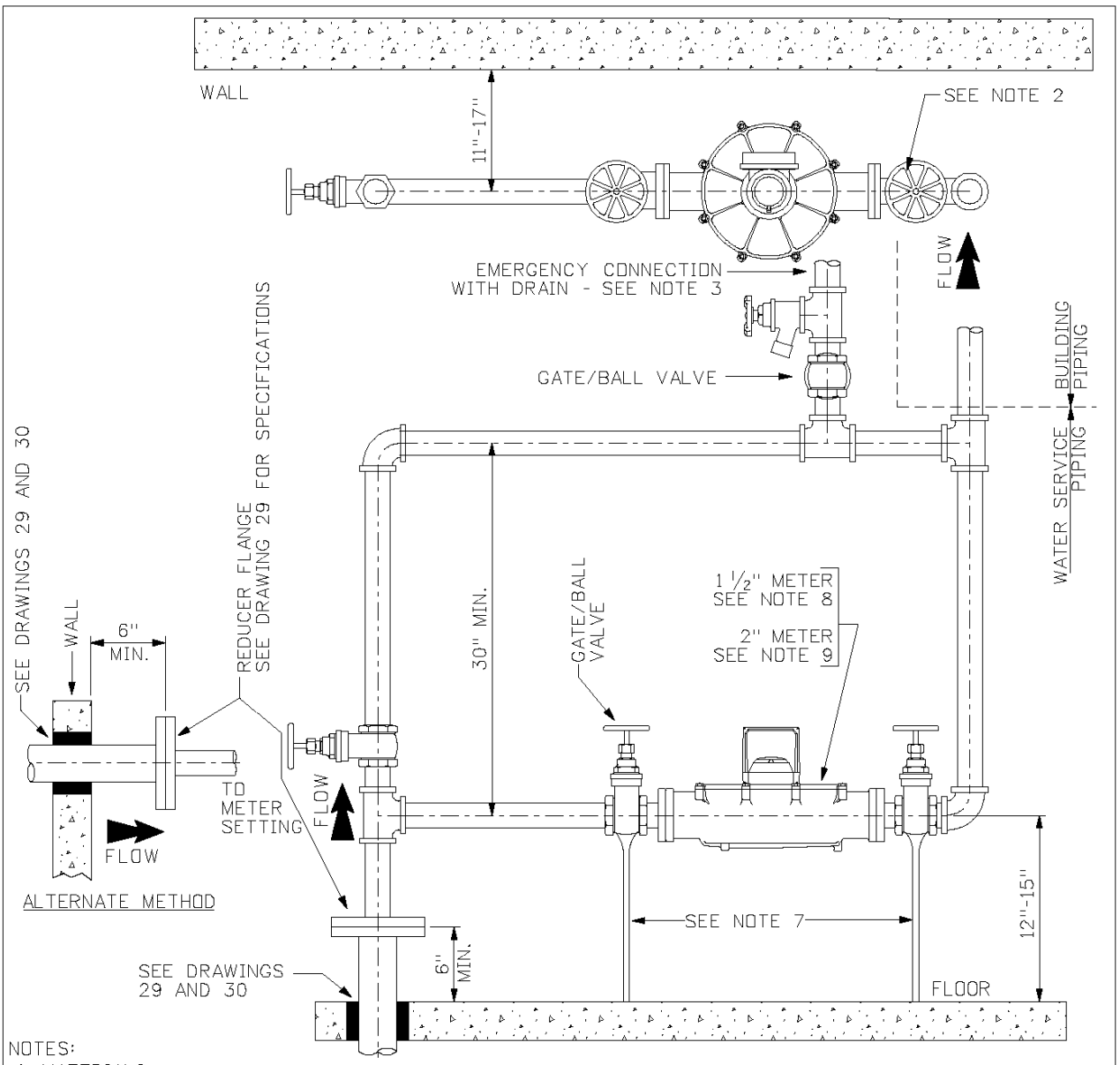
4 FOR VALVE SPECIFICATIONS; SEE APPENDIX D AND E

5 STRAIGHT METER COUPLING M.I.P. X METER SWIVEL NUT MACHINED INSIDE AND OUT.

MILWAUKEE water works Technical Services Group

DESCRIPTION:
METER SETTING
WELL TYPE
5/8", 3/4", 1" METERS

DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 15



NOTES:

1 MATERIALS:
A) ALL NIPPLES, FITTINGS, AND CONNECTIONS: BRASS (FROM THE OUTLET OF THE BYPASS VALVE TO THE OUTLET OF THE OUTLET VALVE MAY BE SWEATED COPPER TYPE - K OR L)
B) INLET PIPE: TYPE - COPPER OR DUCTILE IRON

2 FOR GATE/BALL VALVE SPECIFICATIONS; SEE APPENDIX D AND E

3 LOCATION OF THE EMERGENCY CONNECTION ON EXTERIOR OF BUILDING IS AT OWNERS DISCRETION, BUT SHALL FACILITATE THE CONNECTION. SEE DRAWING 32.

4 BY-PASS AND EMERGENCY SERVICE CONNECTION SHALL EQUAL SIZE OF METER

5 2" METER ALSO AVAILABLE IN COMPOUND TYPE WHEN SPECIFIED BY THE UTILITY; SEE DRAWING 21

6 VICTOLIC FITTINGS, GROOVED PIPE AND MEGALUG TYPE FLANGES SHALL NOT BE PERMITTED.

7 PROVIDE ADEQUATE SUPPORT UNDER INLET VALVE AND OUTLET PIPE BY MEANS OF ADJUSTABLE STANDS.

8 METER FLANGES SHALL BE EQUIVALENT TO 1½" AWWA TWO BOLT ELLIPTICAL FLANGE. METER LAY LENGTH IS 13"

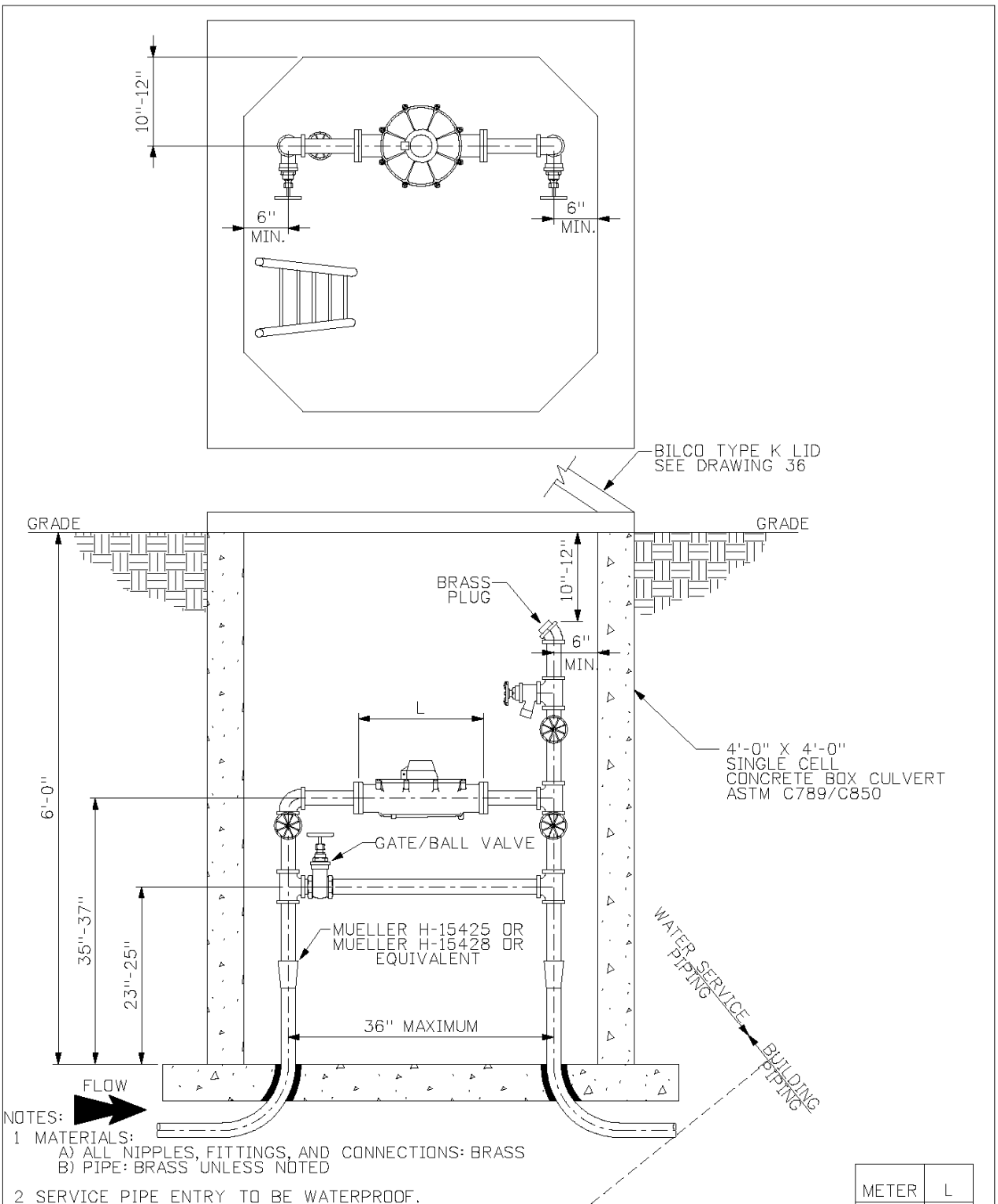
9 METER FLANGES SHALL BE EQUIVALENT TO 2" AWWA TWO BOLT ELLIPTICAL FLANGE. METER LAY LENGTH IS 17"

10 BYPASS PIPING MAY BE HORIZONTAL.

MILWAUKEE Water Works — Technical Services Group

DESCRIPTION:
METER SETTING BASEMENT TYPE 1-1/2", 2" METERS

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 16



NOTES:

1 MATERIALS:
A) ALL NIPPLES, FITTINGS, AND CONNECTIONS: BRASS
B) PIPE: BRASS UNLESS NOTED

2 SERVICE PIPE ENTRY TO BE WATERPROOF.

3 SOLDER JOINTS PROHIBITED ON ALL UNDERGROUND WATER SERVICE PIPING.

4 THIS CONFIGURATION SHALL BE USED IN NON-ROADWAY INSTALLATIONS ONLY.

5 ALL 1½" OR LARGER METERS SHALL HAVE A SOLID BY-PASS INCLUDING AN EMERGENCY CONNECTION EQUAL TO SIZE OF METER.

6 METER FLANGES SHALL BE EQUIVALENT TO 1½" OR 2" AWWA TWO BOLT ELLIPTICAL FLANGE.

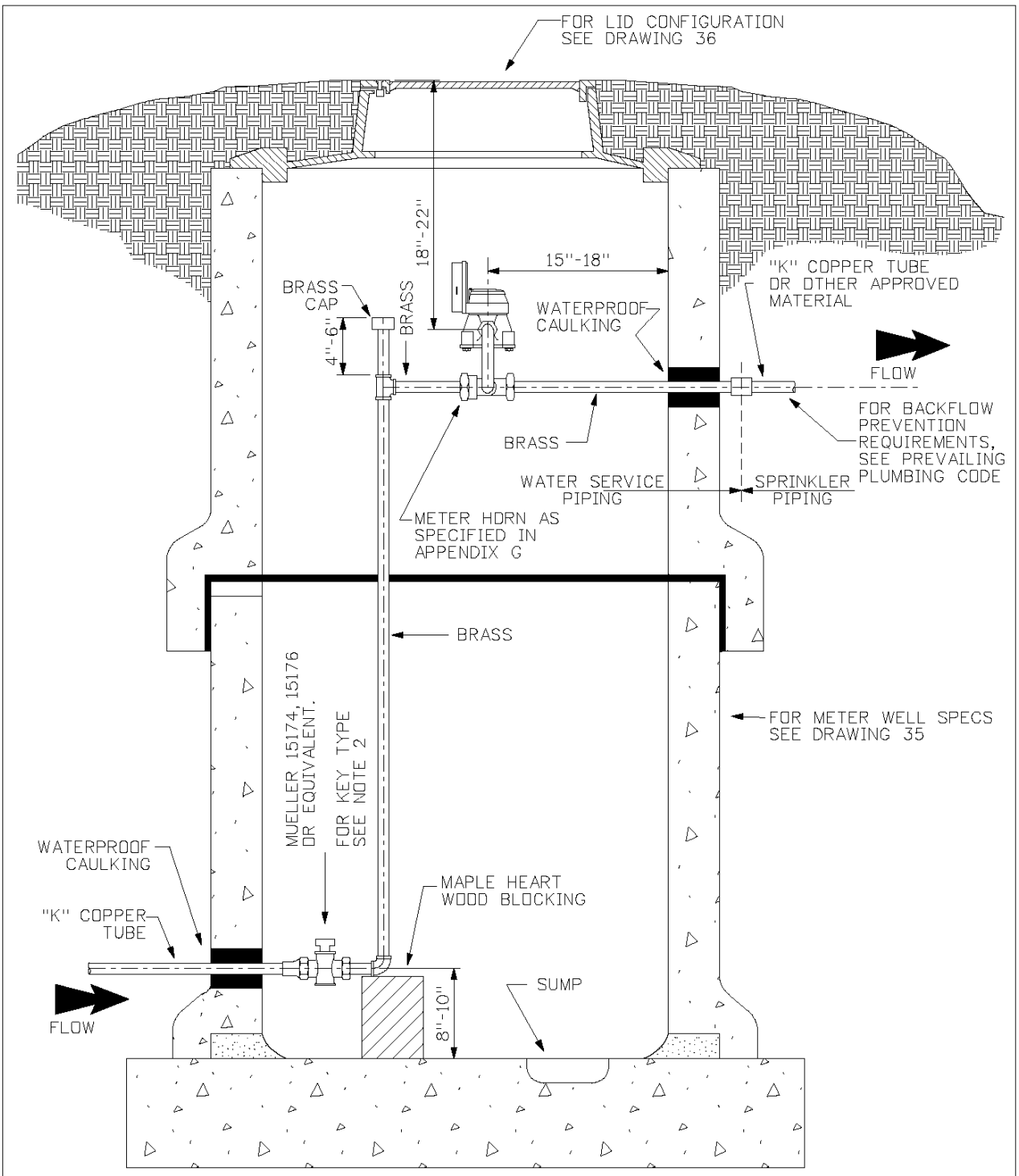
7 FOR GATE/BALL VALVE SPECIFICATIONS: SEE APPENDIX D AND E

METER	L
1½"	13"
2"	17"

MILWAUKEE water works — Technical Services Group

DESCRIPTION:
METER SETTING
WELL TYPE
1-1/2" AND 2" METERS

DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 17



NOTES:

1 MATERIALS:
- A) ALL NIPPLES, FITTINGS, AND CONNECTIONS: BRASS
- B) PIPE: BRASS EXCEPT AS NOTED

2 VALVE KEY EQUAL TO CRANE-850 (1/2" X 4' LG.)

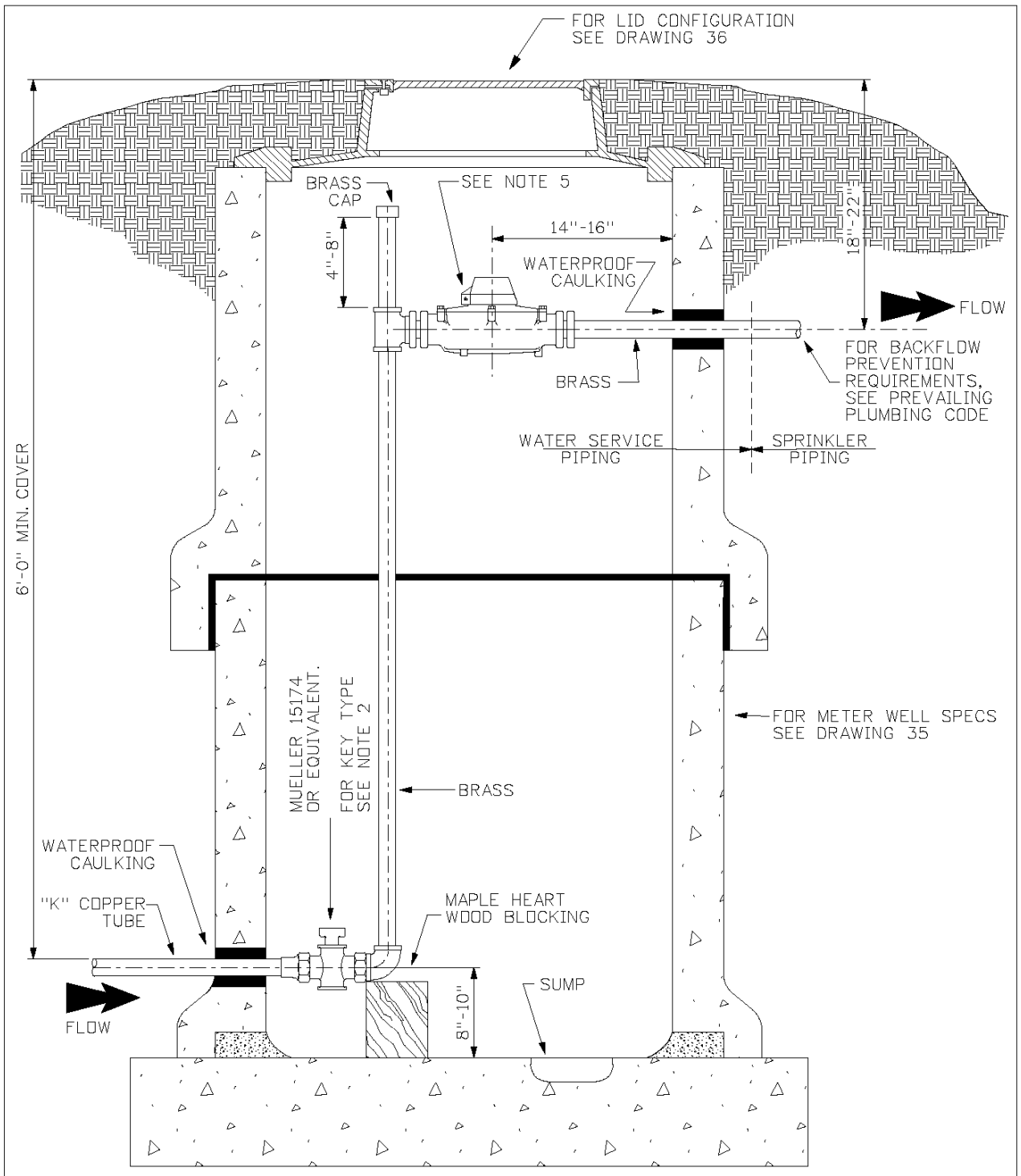
3 SERVICE PIPE ENTRY TO BE WATERPROOF.

4 SOLDER JOINTS PROHIBITED ON ALL UNDERGROUND WATER SERVICE PIPING

MILWAUKEE water works Technical Services Group

DESCRIPTION:
METER SETTING – WELL TYPE
5/8", 3/4" 1" METERS
LAWN SPRINKLERS

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 18



NOTES:

1 MATERIALS:
A) ALL NIPPLES, FITTINGS, AND CONNECTIONS: BRASS
B) PIPE: TYPE - BRASS EXCEPT AS NOTED

2 VALVE KEY EQUAL TO CRANE-850 ($1/2$" X 4' LG.)

3 SERVICE PIPE ENTRY TO BE WATERPROOF.

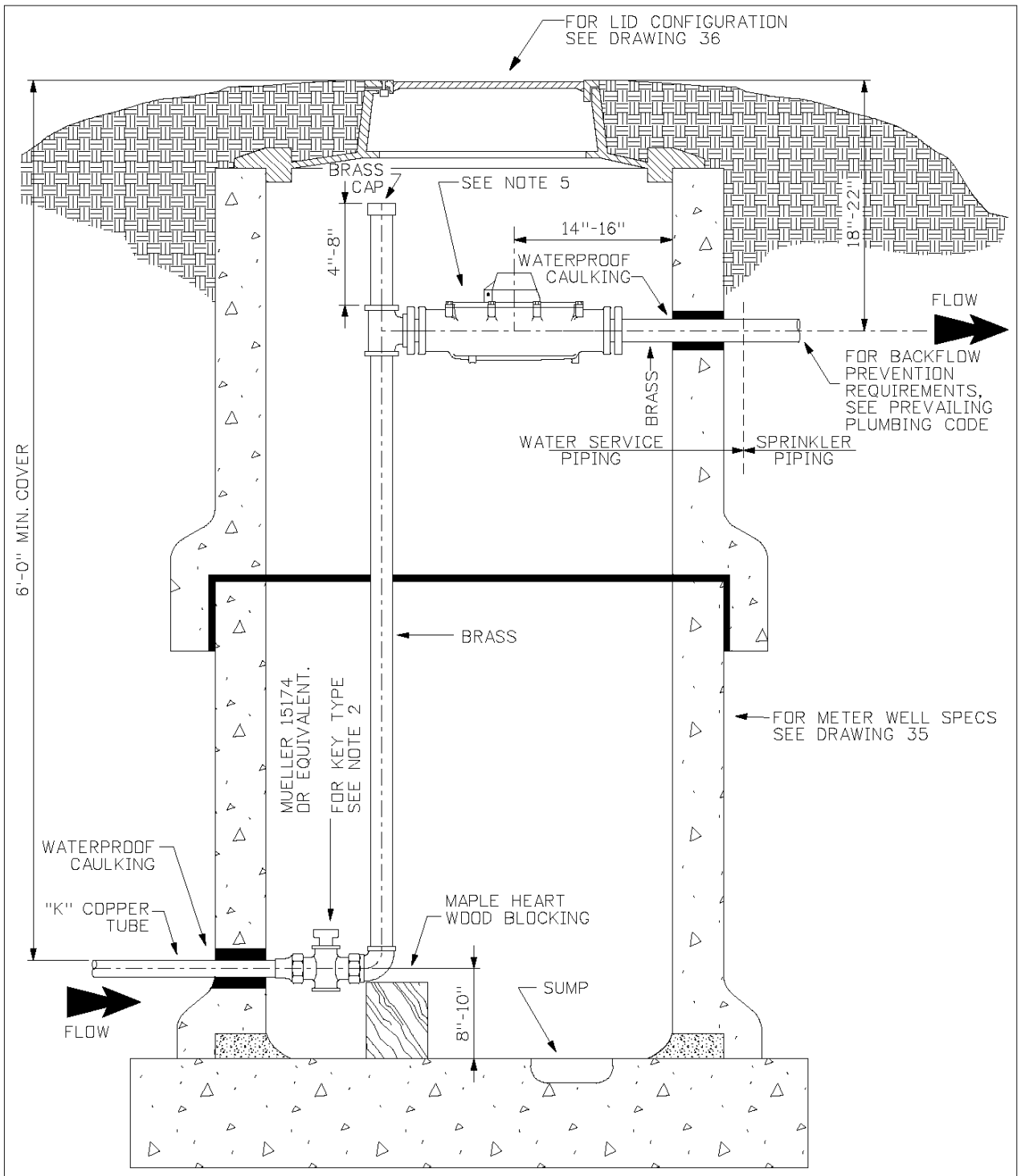
4 SOLDER JOINTS PROHIBITED ON ALL UNDERGROUND WATER SERVICE PIPING.

5 METER FLANGES SHALL BE EQUIVALENT TO $1\frac{1}{2}$" AWWA TWO BOLT ELLIPTICAL FLANGE. METER LAY LENGTH IS 13"

MILWAUKEE water works Technical Services Group

DESCRIPTION:
METER SETTING - WELL TYPE
1-1/2" METER
LAWN SPRINKLER

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 19



NOTES:

1 MATERIALS:
A) ALL NIPPLES, FITTINGS, AND CONNECTIONS: BRASS
B) PIPE: TYPE - BRASS EXCEPT AS NOTED

2 VALVE KEY EQUAL TO CRANE-850 ($1/2$" X 4'LG.)

3 SERVICE PIPE ENTRY TO BE WATERPROOF.

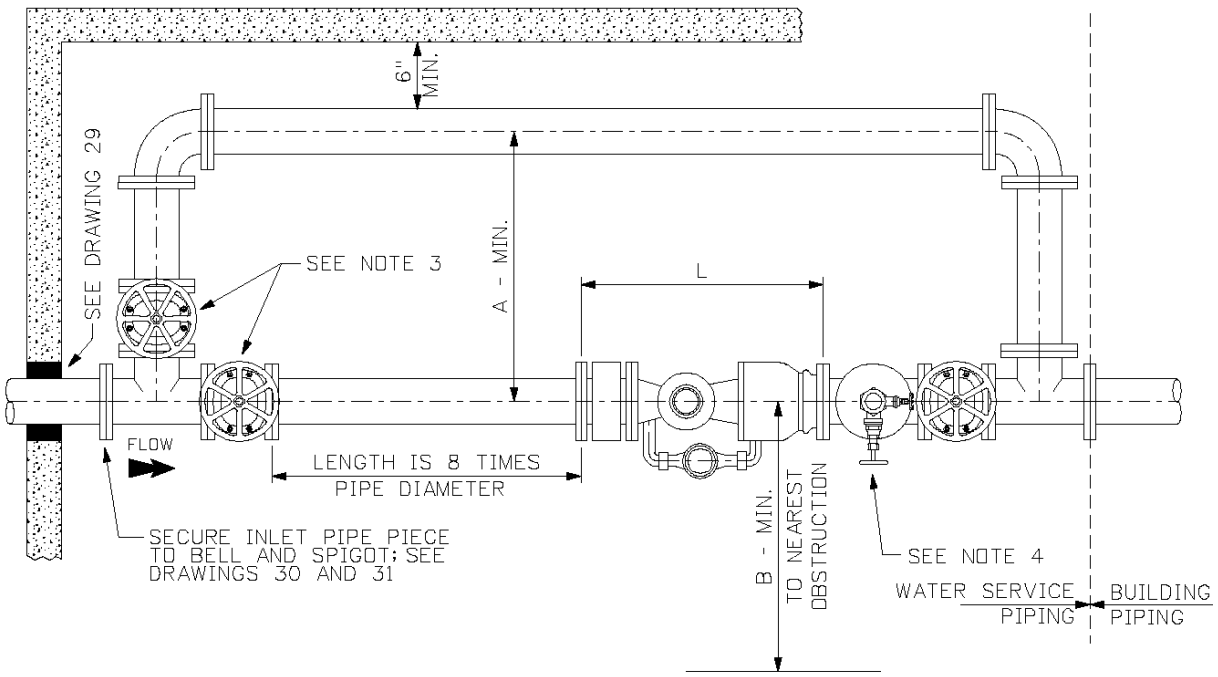
4 SOLDER JOINTS PROHIBITED ON ALL UNDERGROUND WATER SERVICE PIPING.

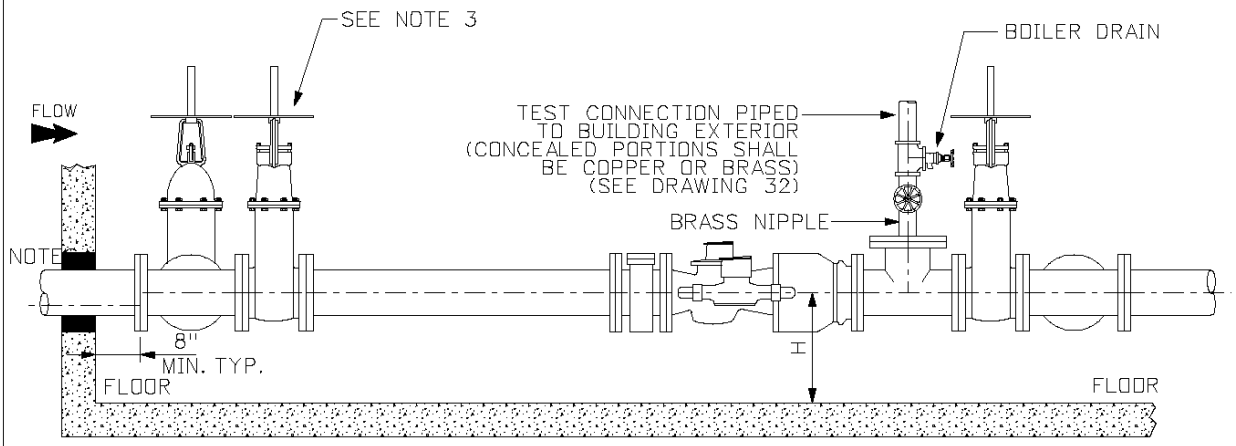
5 METER FLANGES SHALL BE EQUIVALENT TO 2" AWWA TWO BOLT ELLIPTICAL FLANGE. METER LAY LENGTH IS 17"

MILWAUKEE water works Technical Services Group

DESCRIPTION:
METER SETTING - WELL TYPE
2" METER
LAWN SPRINKLER

DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 20





METER	BY-PASS	TEST VALVE	A	B	L	H
2"	2"	2"	36"	36"	17"	12"-24"
3"	3"	2"	36"	36"	24"	12"-24"
4"	4"	2"	36"	42"	29"	12"-24"
6"	6"	3"	42"	48"	36"	15"-24"
8"	8"	3"	42"	48"	42"	18"-24"
10"	10"	3"	48"	48"	48"	20"-24"

FOR NOTES REFERENCED ON THIS DRAWING, SEE DRAWING 21N

MILWAUKEE water works Technical Services Group

DESCRIPTION:
METER SETTING
BASEMENT TYPE
2", 3", 4", 8", 12" METERS

DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 21

NOTES:

1 MATERIALS:
   A) TEST CONNECTION: TYPE-L COPPER OR THREADED GALVANIZED
   B) BY-PASS PIPING: FLANGED GALVANIZED, FLANGED DUCTILE IRON OR 2", 3" OR 4" COPPER TYPE - L
   C) ALL OTHER: FLANGED GALVANIZED OR FLANGED DUCTILE IRON

2 IF METER SIZE IS SMALLER THAN PIPE SIZE, REDUCTION SHALL BE MADE WITH A REDUCING TEE OR CONCENTRIC REDUCERS. ANY SPOOL PIECE USED SHALL BE AT LEAST 3" LONG BETWEEN FLANGES.

3 FOR O.S. & Y. SPECIFICATIONS; SEE APPENDIX C

4 FOR GATE VALVE AND BALL VALVE SPECIFICATIONS; SEE APPENDIX D AND E

5 VICTOLIC FITTINGS, GROOVED PIPE AND MEGALUG TYPE FLANGES SHALL NOT BE USED.

6 PROVIDE AMPLE RIGID SUPPORT UNDER PIPING AND AROUND METER SUCH THAT THE ENTIRE SETTING IS STRUCTURALLY STABLE WITH THE METER REMOVED, MINIMALLY AT THE FOLLOWING LOCATIONS: AT THE MID-POINT OF THE STRAIGHT SPOOL PIECE BEFORE THE METER, UNDER THE OUTLET VALVE, AND AT EACH BEND IN THE BY-PASS PIPING. ADDITIONAL LOCATIONS MAY BE NECESSARY TO ACHIEVE STRUCTURAL STABILITY.

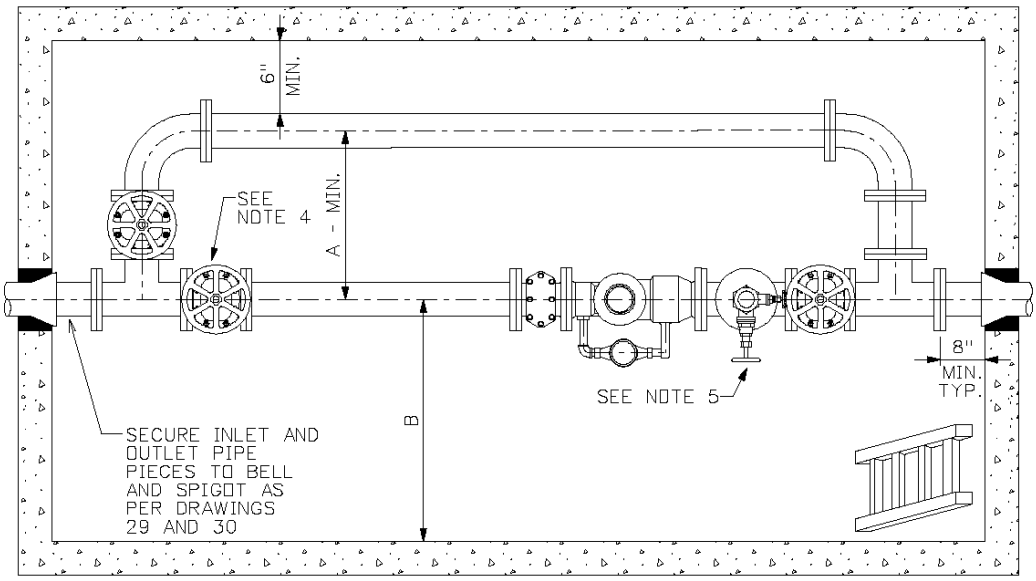
7 BY-PASS MAY BE PLACED OVERHEAD, WITH 5'-6" TO 6'-6" ℄ OF BY-PASS TO ℄ OF METER CLEARANCE.

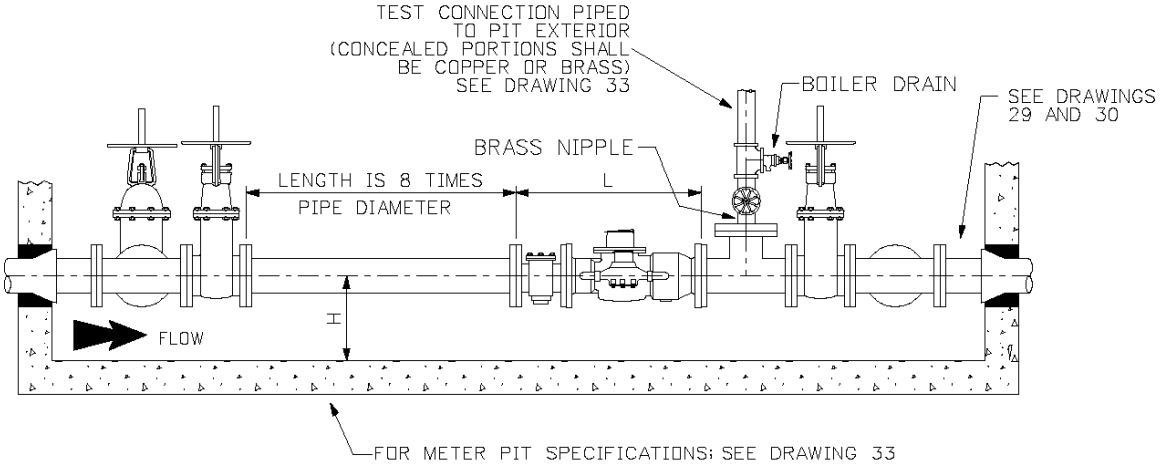
8 METER SHALL IMMEDIATELY FOLLOW THE STRAIGHT SPOOL PIECE, THE TEST TEE SHALL IMMEDIATELY FOLLOW THE METER AND THE OUTLET VALVE SHALL IMMEDIATELY FOLLOW THE TEST TEE.

MILWAUKEE water works Technical Services Group

DESCRIPTION:
NOTES – METER SETTING BASEMENT TYPE 2", 3", 4", 8", 10" METERS

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 21N





METER	BY PASS	TEST VALVE	L	A	B	H
2"	2"	2"	17"	36"	40"	12"-24"
3"	3"	2"	24"	36"	40"	12"-24"
4"	4"	2"	29"	36"	42"	12"-24"
6"	6"	3"	36"	42"	48"	15"-24"
8"	8"	3"	42"	42"	48"	18"-24"
10"	10"	3"	48"	48"	48"	20"-24"

MILWAUKEE water works Technical Services Group

DESCRIPTION:
METER SETTING
PIT TYPE
2", 3", 4", 6", 8", 10" METERS

DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 22

FOR NOTES REFERENCED ON THIS DRAWING, SEE DRAWING 22N

NOTES:

1 MATERIALS:
A) TEST CONNECTION: TYPE-L COPPER OR THREADED GALVANIZED
B) BY-PASS PIPING: FLANGED GALVANIZED, FLANGED DUCTILE IRON OR 2", 3" OR 4" COPPER TYPE - L
C) ALL OTHER: FLANGED GALVANIZED OR FLANGED DUCTILE IRON

2 IF METER SIZE IS SMALLER THAN PIPE SIZE, REDUCTION SHALL BE MADE WITH A REDUCING TEE OR CONCENTRIC REDUCERS. ANY SPOOL PIECE USED SHALL BE AT LEAST 3" LONG BETWEEN FLANGES.

3 FOR D.S. & Y. SPECIFICATIONS; SEE APPENDIX C

4 FOR GATE VALVE AND BALL VALVE SPECIFICATIONS; SEE APPENDIX D AND E

5 VICTOLIC FITTINGS, GROOVED PIPE AND MEGALUG TYPE FLANGES SHALL NOT BE USED.

6 PROVIDE AMPLE RIGID SUPPORT UNDER PIPING AND ARDUND METER SUCH THAT THE ENTIRE SETTING IS STRUCTURALLY STABLE WITH THE METER REMOVED, MINIMALLY AT THE FOLLOWING LOCATIONS: AT THE MID-POINT OF THE STRAIGHT SPOOL PIECE BEFORE THE METER, UNDER THE OUTLET VALVE, AND AT EACH BEND IN THE BY-PASS PIPING. ADDITIONAL LOCATIONS MAY BE NECESSARY TO ACHIEVE STRUCTURAL STABILITY.

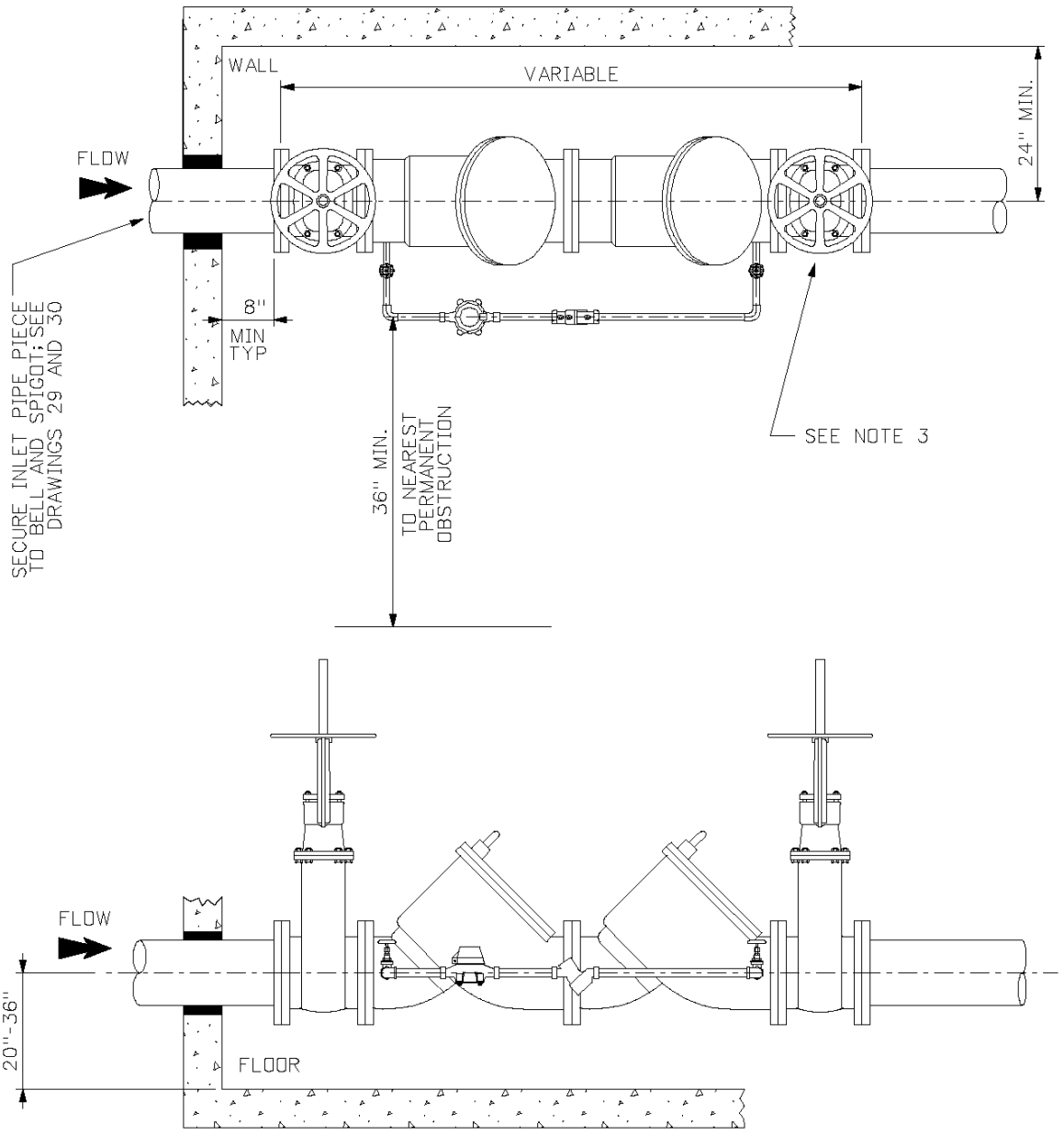
7 BY-PASS MAY BE PLACED OVERHEAD, WITH 5'-6" TO 6'-6" ℄ OF BY-PASS TO ℄ OF METER CLEARANCE.

8 METER SHALL IMMEDIATELY FOLLOW THE STRAIGHT SPOOL PIECE, THE TEST TEE SHALL IMMEDIATELY FOLLOW THE METER AND THE OUTLET VALVE SHALL IMMEDIATELY FOLLOW THE TEST TEE.

MILWAUKEE water works Technical Services Group

DESCRIPTION:
NOTES - METER SETTING
PIT TYPE
2", 3", 4", 6", 8", 10" METERS

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 22N



NOTES:

1 MATERIALS:
A) DETECTOR CHECK BY-PASS METER PIPING SHALL BE BRASS
B) ALL OTHER: FLANGED GALVANIZED OF FLANGED DUCTILE IRON.

2 VICTOLIC FITTINGS, GROOVED PIPE, AND MEGALUG TYPE FLANGES SHALL NOT BE USED.

3 PROVIDE AMPLE RIGID SUPPORT UNDER PIPING AND ASSEMBLY.

4 FOR DOUBLE DETECTOR CHECK ASSEMBLIES, SEE APPENDIX K.

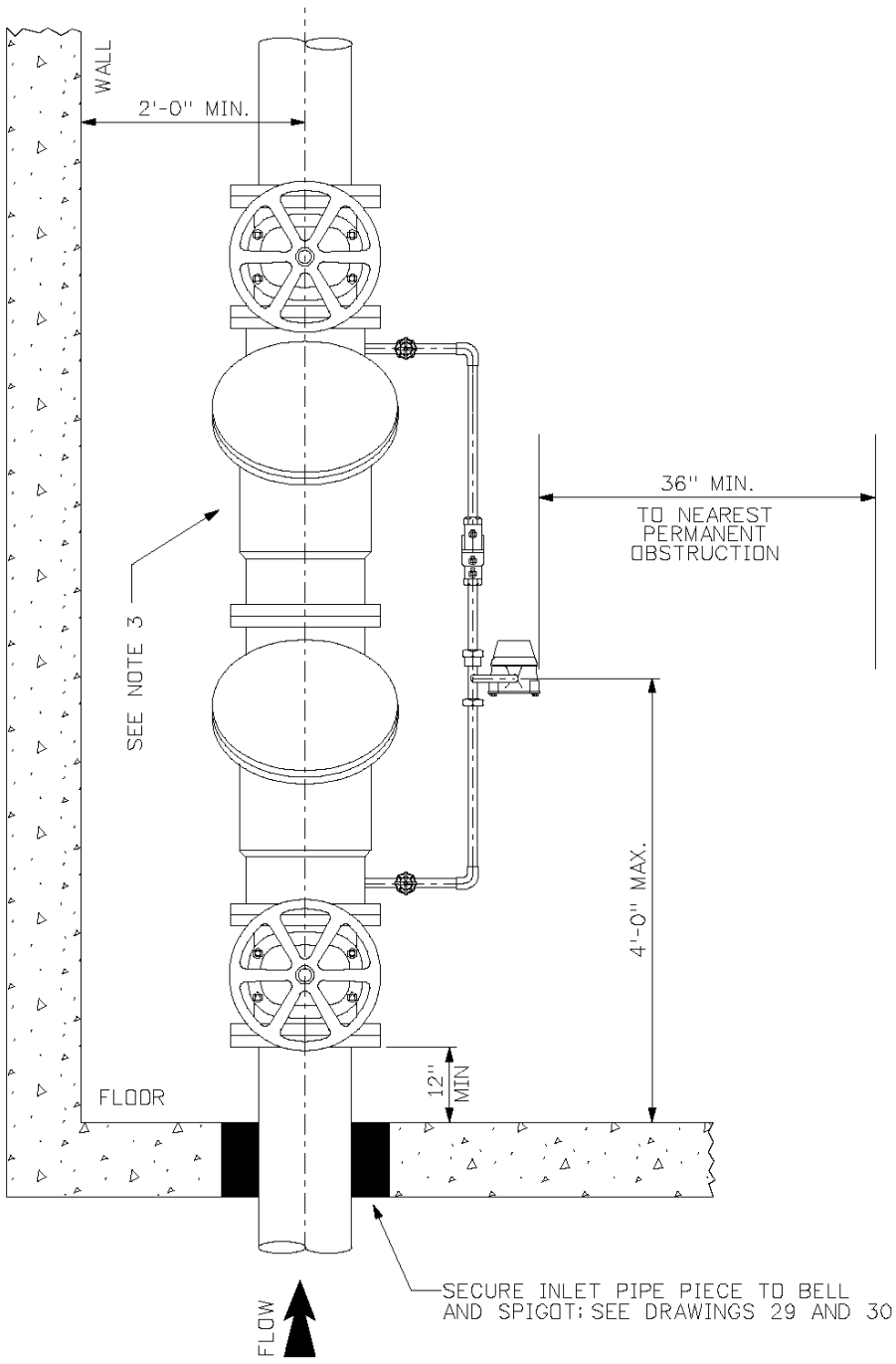
5 ALL DOUBLE DETECTOR CHECK ASSEMBLIES SHALL BE TESTED PER THE STATE OF WISCONSIN PLUMBING CODE.

6 THE BY-PASS METER SHALL BE IN THE HORIZONTAL PLANE.

MILWAUKEE water works — Technical Services Group

DESCRIPTION:
DOUBLE DETECTOR CHECK
BASEMENT SETTING
NO DOMESTIC TEE

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 23



NOTES:

1 MATERIALS:
A) DETECTOR CHECK BY-PASS METER PIPING SHALL BE BRASS
B) ALL OTHER: FLANGED GALVANIZED OF FLANGED DUCTILE IRON.

2 VICTOLIC FITTINGS, GROOVED PIPE, AND MEGALUG TYPE FLANGES SHALL NOT BE USED.

3 FOR DOUBLE DETECTOR CHECK ASSEMBLIES, SEE APPENDIX K.

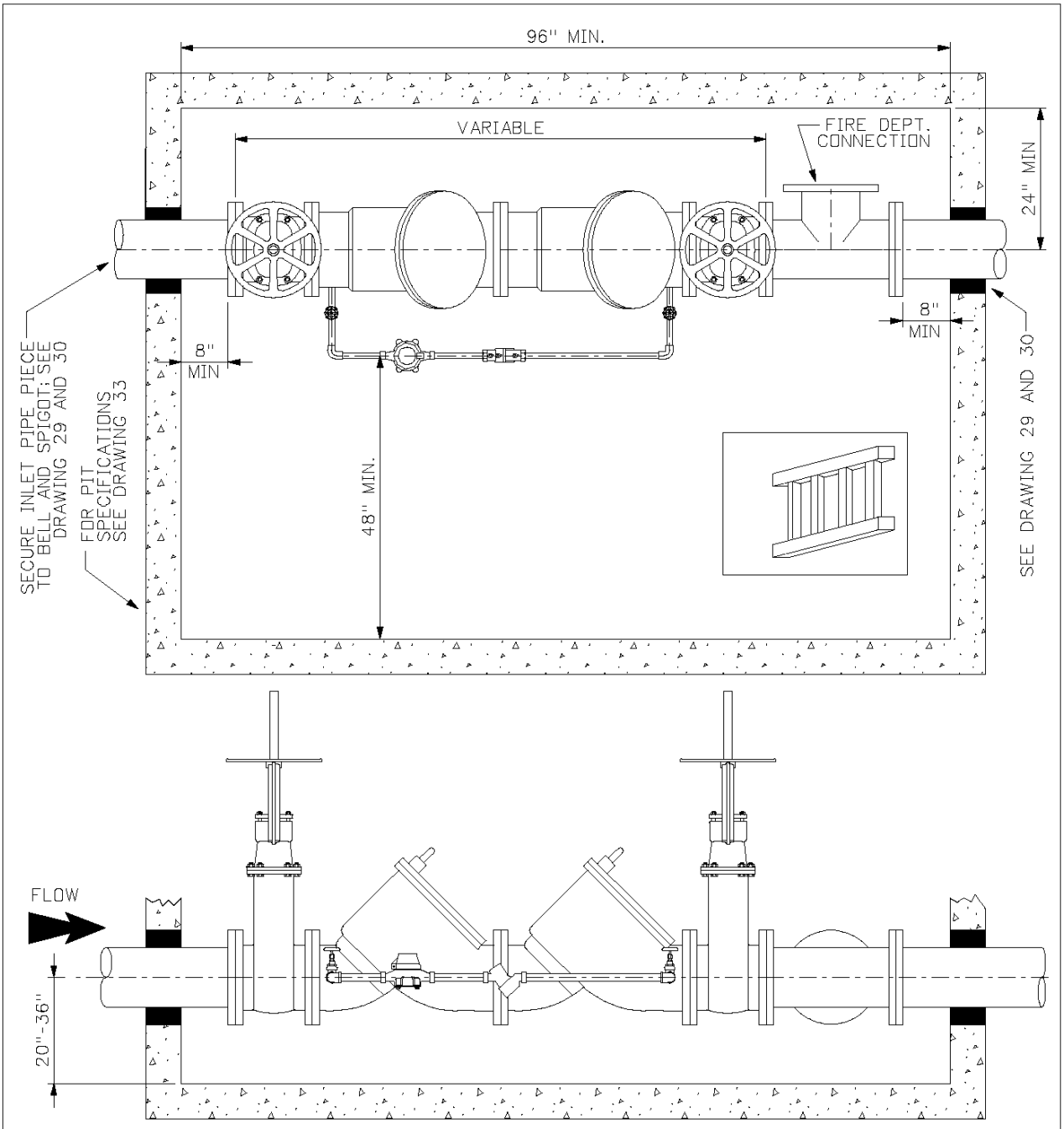
4 ALL DOUBLE DETECTOR CHECK ASSEMBLIES SHALL BE TESTED PER THE STATE OF WISCONSIN PLUMBING CODE.

5 THE BY-PASS METER SHALL BE IN THE HORIZONTAL PLANE. A METER HORN (SEE APPENDIX G) SHALL BE USED FOR THE BY-PASS METER SETTING. ALL METER VALVES SHALL BE IN THE HORIZONTAL PLANE.

MILWAUKEE water works Technical Services Group

DESCRIPTION:
VERTICAL DOUBLE DETECTOR CHECK - BASEMENT SETTING NO DOMESTIC TEE

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 24



NOTES:

1 MATERIALS:
A) DETECTOR CHECK BY-PASS METER PIPING SHALL BE BRASS
B) ALL OTHER: FLANGED GALVANIZED OF FLANGED DUCTILE IRON.

2 VICTOLIC FITTINGS, GROOVED PIPE, AND MEGALUG TYPE FLANGES SHALL NOT BE USED.

3 PROVIDE AMPLE RIGID SUPPORT UNDER PIPING AND ASSEMBLY.

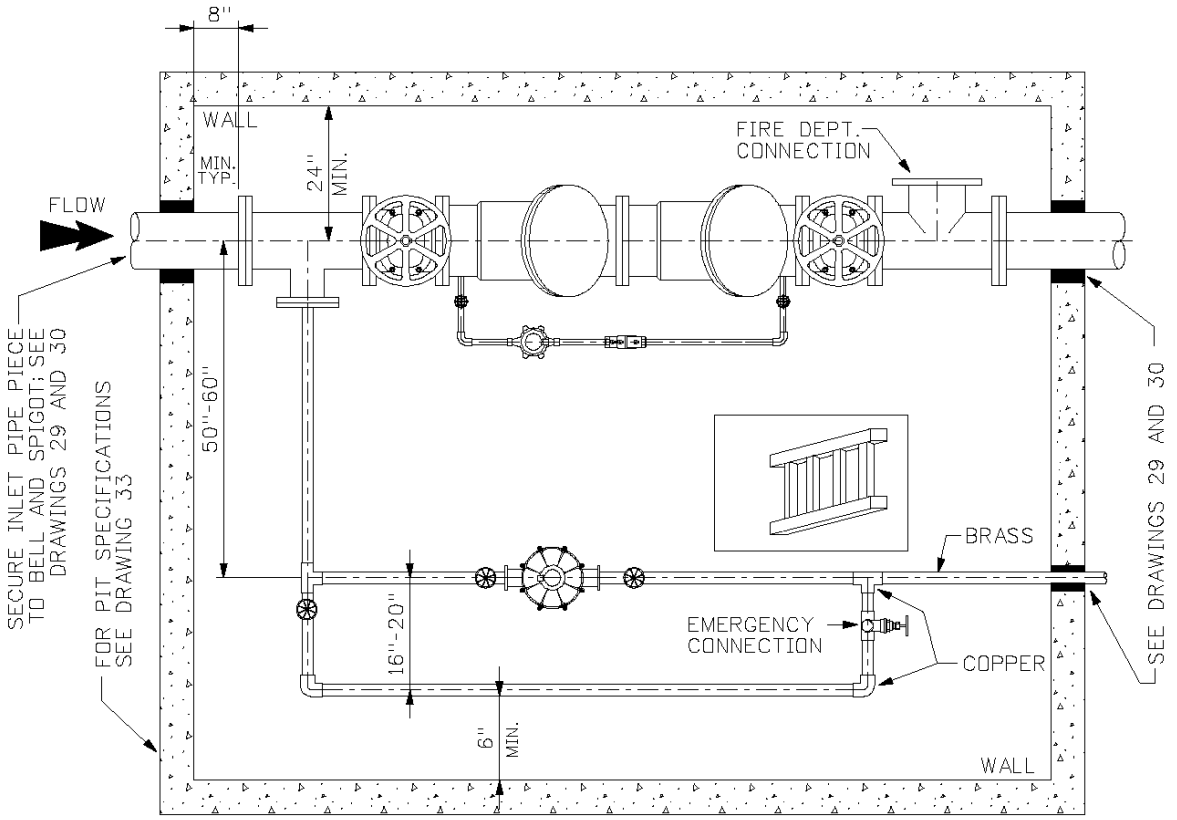
4 FOR DOUBLE DETECTOR CHECK ASSEMBLIES, SEE APPENDIX K.

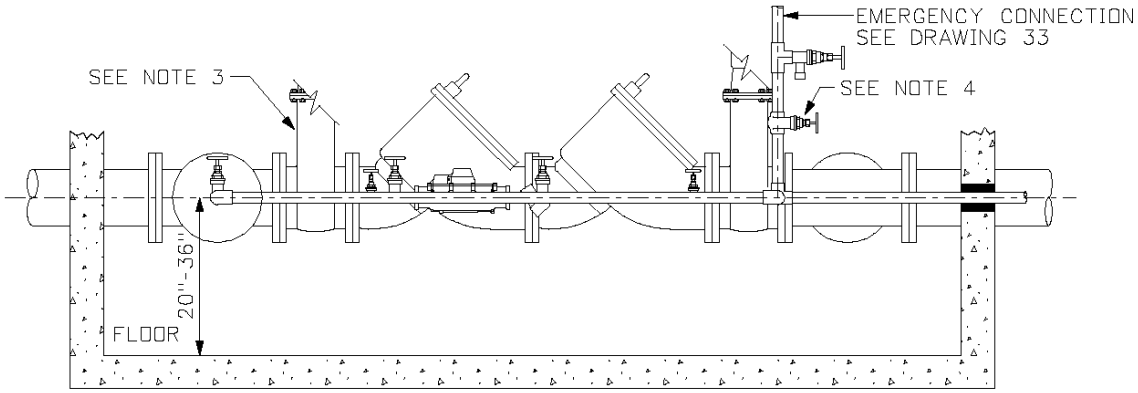
5 ALL DOUBLE DETECTOR CHECK ASSEMBLIES SHALL BE TESTED PER THE STATE OF WISCONSIN PLUMBING CODE.

MILWAUKEE water works — Technical Services Group

DESCRIPTION:
DOUBLE DETECTOR CHECK PIT SETTING NO DOMESTIC TEE

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 25





FOR NOTES REFERENCED ON THIS DRAWING, SEE DRAWING 26N

MILWAUKEE water works Technical Services Group

DESCRIPTION:
COMBINED FIRE/DOMESTIC IN A PIT 1-1/2" OR 2" DOMESTIC

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 26

NOTES:

1 MATERIALS:
- A) DETECTOR CHECK BY-PASS METER PIPING: SHALL BE BRASS
- B) EMERGENCY CONNECTION: COPPER TYPE - L OR THREADED GALVANIZED
- C) DOMESTIC PIPING: BRASS, (FROM THE OUTLET OF THE BY-PASS VALVE TO THE TEE AFTER THE OUTLET VALVE MAY BE SWEATED COPPER TYPE L)
- D) ALL OTHER: FLANGED GALVANIZED OR FLANGED DUCTILE IRON

2 VICTOLIC FITTINGS, GROOVED PIPE AND MEGALUG TYPE FLANGES SHALL NOT BE USED.

3 IF METER SIZE IS SMALLER THAN PIPE SIZE, REDUCTION SHALL BE MADE WITH A REDUCING TEE OR WITH CONCENTRIC REDUCERS. ANY SPOOL PIECE USED SHALL BE AT LEAST 3" LONG BETWEEN FLANGES

4 FOR D.S.&Y. SPECIFICATIONS; SEE APPENDIX C

5 FOR GATE VALVE AND BALL VALVE SPECIFICATIONS; SEE APPENDIX D AND E

6 FOR DOUBLE DETECTOR CHECK ASSEMBLIES SEE APPENDIX K

7 THE DOUBLE DETECTOR CHECK ASSEMBLIES SHALL BE INSTALLED SUCH THAT THE BY-PASS METER IS TOWARDS THE CENTER OF THE PIT.

8 ALL DOUBLE DETECTOR CHECK ASSEMBLIES SHALL BE TESTED PER THE STATE OF WISCONSIN PLUMBING CODE.

9 PROVIDE AMPLE RIGID SUPPORT UNDER PIPING AND AROUND WATER METER SUCH THAT THE ENTIRE SETTING IS STRUCTURALLY STABLE WITH THE METER REMOVED, MINIMALLY AT THE FOLLOWING LOCATIONS: AT THE MID-POINT OF THE STRAIGHT SPOOL PIECE BEFORE THE METER, UNDER THE OUTLET VALVE, AND AT EACH BEND OF THE BY-PASS PIPING. ADDITIONAL LOCATIONS MAY BE NECESSARY TO ACHIEVE STRUCTURAL STABILITY.

10 BY-PASS MAY BE PLACED OVERHEAD, WITH 5'-6" TO 6'-6" ℄ OF BY-PASS TO ℄ OF METER CLEARANCE.

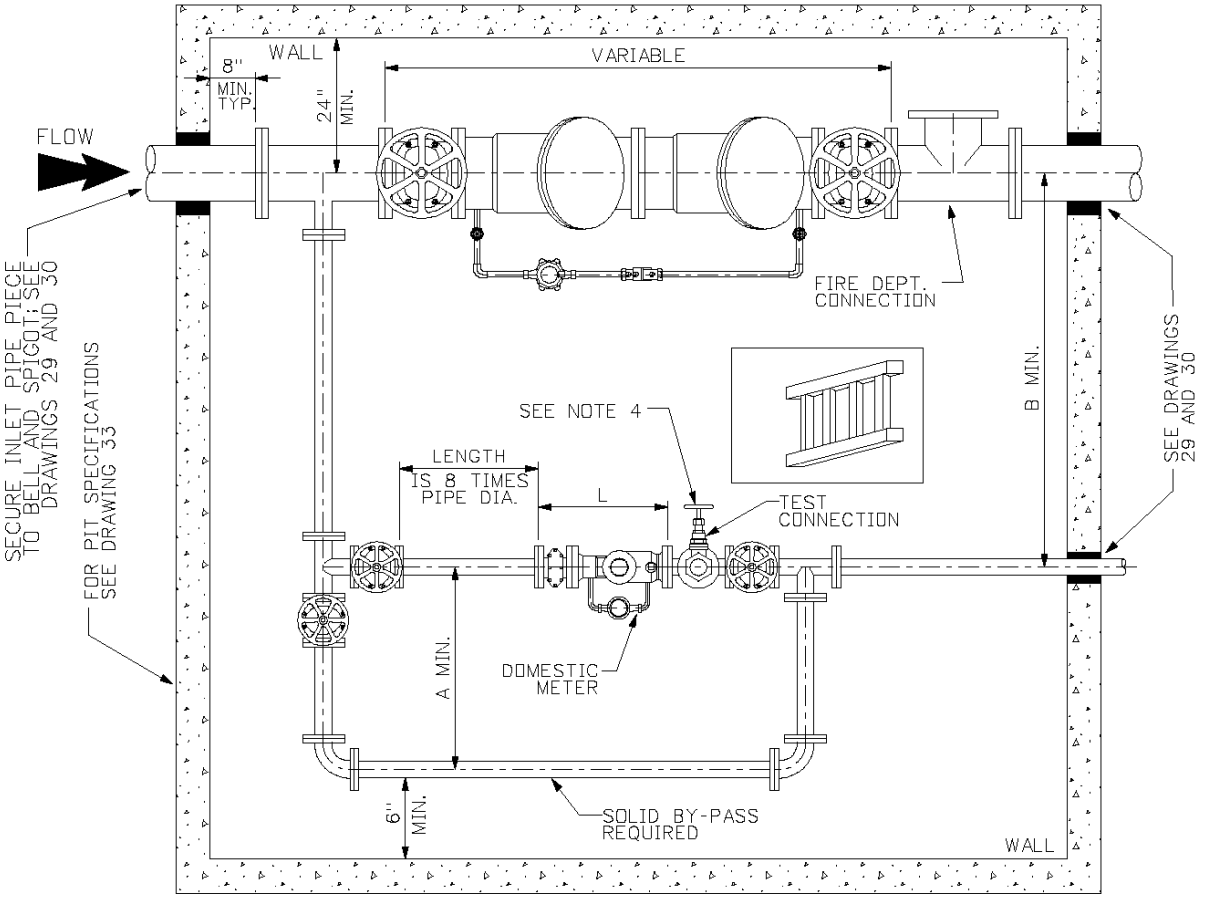
11 METER FLANGES SHALL BE EQUIVALENT TO 1½" AWWA TWO BOLT ELLIPTICAL FLANGE. METER LAY LENGTH IS 13".

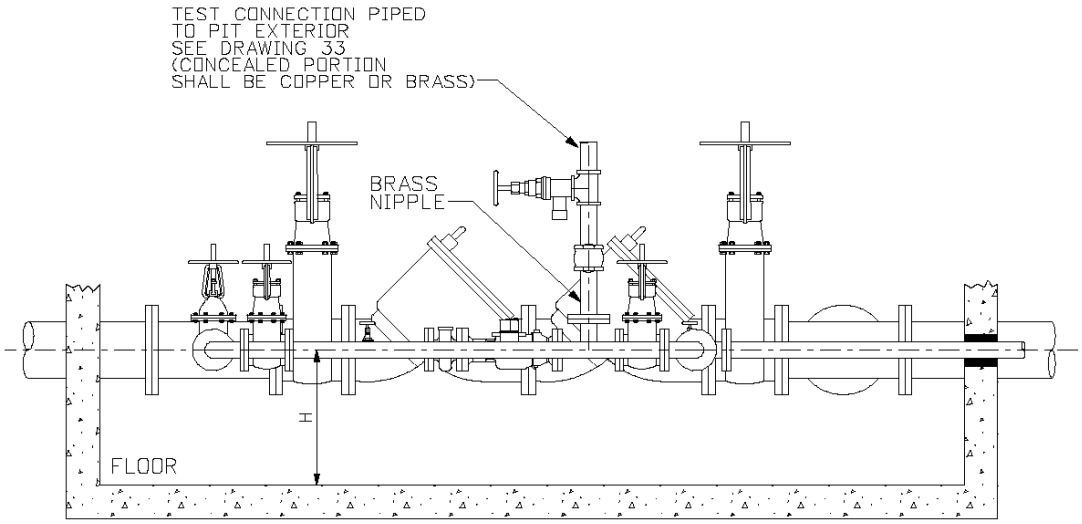
12 METER FLANGES SHALL BE EQUIVALENT TO 2" AWWA TWO BOLT ELLIPTICAL FLANGE. METER LAY LENGTH IS 17".

MILWAUKEE water works — Technical Services Group

DESCRIPTION:
NOTES – COMBINED FIRE/ DOMESTIC IN A PIT 1-1/2" OR 2" DOMESTIC

DRAWN BY:	DATE:	DRAWING NO.:
SPM	6-12-2002	26N





METER	BY PASS	TEST VALVE	L	A	B	H
2"	2"	2"	17"	36"	50"	12"-24"
3"	3"	2"	24"	36"	50"	12"-24"
4"	4"	2"	29"	36"	50"	12"-24"
6"	6"	3"	36"	42"	60"	15"-24"
8"	8"	3"	42"	42"	60"	18"-24"
10"	10"	3"	48"	48"	60"	20"-24"

FOR NOTES REFERENCED ON THIS DRAWING, SEE DRAWING 27N

MILWAUKEE water works Technical Services Group

DESCRIPTION:
COMBINED FIRE/DOMESTIC IN A PIT 3" OR LARGER DOMESTIC

DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 27

NOTES:

1 MATERIALS:
- A) DETECTOR CHECK BY-PASS METER PIPING: SHALL BE BRASS
- B) TEST CONNECTION: COPPER TYPE - L OR THREADED GALVANIZED
- C) DOMESTIC BY-PASS PIPING: FLANGED GALVANIZED, FLANGED DUCTILE IRON, OR 2", 3" OR 4" COPPER TYPE - L
- D) ALL OTHER: FLANGED GALVANIZED OR FLANGED DUCTILE IRON

2 VICTOLIC FITTINGS, GROOVED PIPE AND MEGALUG TYPE FLANGES SHALL NOT BE USED.

3 IF METER SIZE IS SMALLER THAN PIPE SIZE, REDUCTION SHALL BE MADE WITH A REDUCING TEE OR WITH CONCENTRIC REDUCERS. ANY SPOOL PIECE USED SHALL BE AT LEAST 3" LONG BETWEEN FLANGES

4 FOR D.S.&Y. SPECIFICATIONS: SEE APPENDIX C

5 FOR GATE VALVE AND BALL VALVE SPECIFICATIONS: SEE APPENDIX D AND E

6 FOR DOUBLE DETECTOR CHECK ASSEMBLIES SEE APPENDIX K

7 THE DOUBLE DETECTOR CHECK ASSEMBLIES SHALL BE INSTALLED SUCH THAT THE BY-PASS METER IS TOWARDS THE CENTER OF THE PIT.

8 ALL DOUBLE DETECTOR CHECK ASSEMBLIES SHALL BE TESTED PER THE STATE OF WISCONSIN PLUMBING CODE.

9 PROVIDE AMPLE RIGID SUPPORT UNDER PIPING AND AROUND WATER METER SUCH THAT THE ENTIRE SETTING IS STRUCTURALLY STABLE WITH THE METER REMOVED, MINIMALLY AT THE FOLLOWING LOCATIONS: AT THE MID-POINT OF THE STRAIGHT SPOOL PIECE BEFORE THE METER, UNDER THE OUTLET VALVE, AND AT EACH BEND OF THE BY-PASS PIPING. ADDITIONAL LOCATIONS MAY BE NECESSARY TO ACHIEVE STRUCTURAL STABILITY.

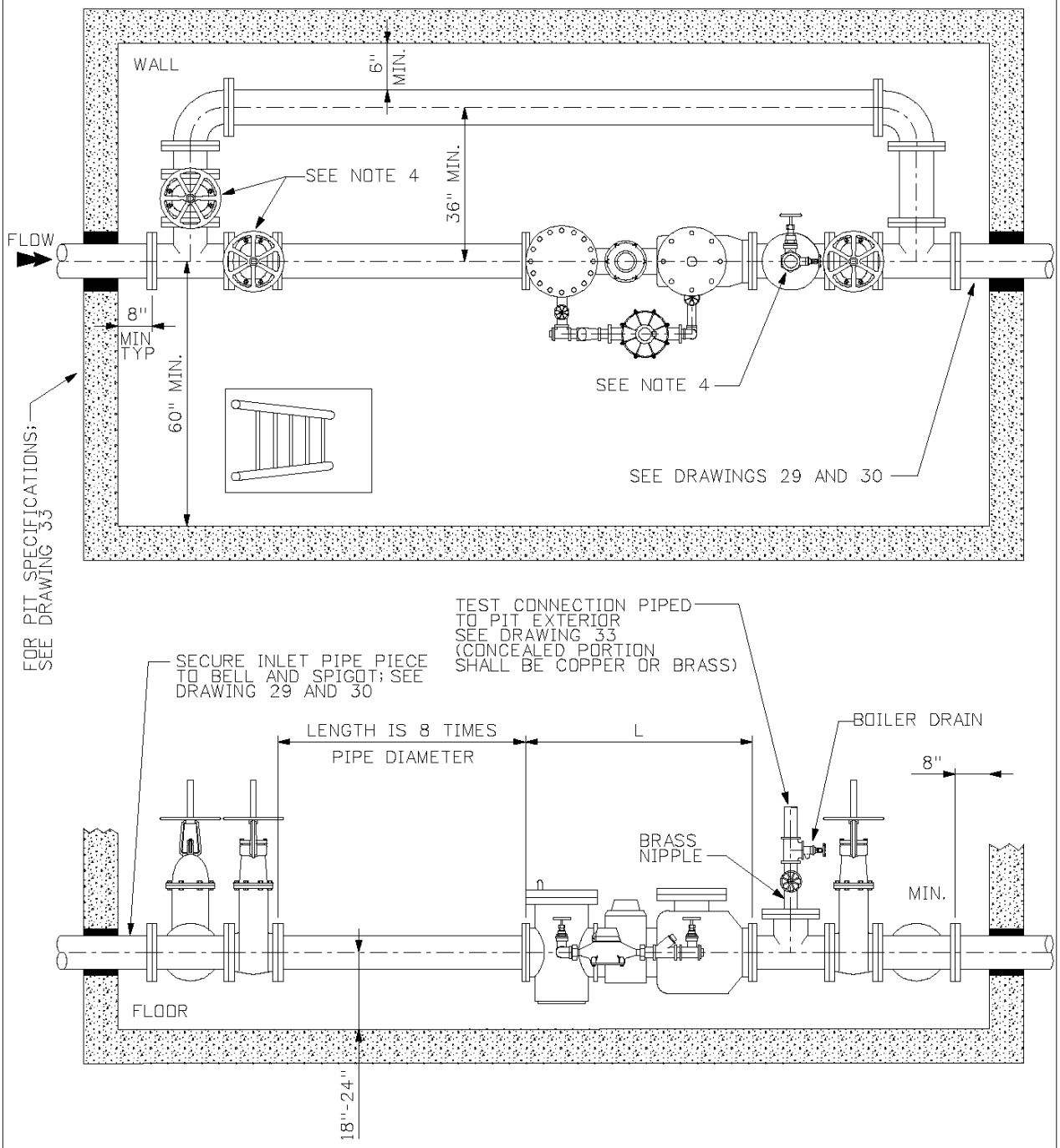
10 BY-PASS MAY BE PLACED OVERHEAD, WITH 5'-6" TO 6'-6" ℄ OF BY-PASS TO ℄ OF METER CLEARANCE.

11 METER SHALL IMMEDIATELY FOLLOW THE STRAIGHT SPOOL PIECE, THE TEST TEE SHALL IMMEDIATELY FOLLOW THE METER AND THE OUTLET VALVE SHALL IMMEDIATELY FOLLOW THE TEST TEE.

MILWAUKEE water works Technical Services Group

DESCRIPTION:
NOTES - COMBINED FIRE/ DOMESTIC IN A PIT 3" OR LARGER DOMESTIC

DRAWN BY:	DATE:	DRAWING NO.:
SPM	6-12-2002	27N



METER	BY PASS	TEST VALVE	L
4"	4"	3"	33"
6"	6"	3"	45"
8"	8"	3"	53"
10"	10"	3"	68"

MILWAUKEE water works Technical Services Group

DESCRIPTION:
METER SETTING – FULL FLOW FIRE METER IN A PIT

DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 28

FOR NOTES REFERENCED ON THIS DRAWING, SEE DRAWING 28N

NOTES:

1 MATERIALS:
A) TEST CONNECTION: COPPER TYPE - L OR THREADED GALVANIZED
B) BY-PASS PIPING: FLANGED GALVANIZED OR FLANGED DUCTILE IRON,
C) ALL OTHER: FLANGED GALVANIZED OR FLANGED DUCTILE IRON.

2 VICTOLIC FITTINGS, GROOVED PIPE AND MEGALUG TYPE FLANGES SHALL NOT BE USED.

3 IF METER SIZE IS SMALLER THAN PIPE SIZE, REDUCTION SHALL BE MADE WITH A REDUCING TEE OR WITH CONCENTRIC REDUCERS. ANY SPOOL PIECE USED SHALL BE AT LEAST 3" LONG BETWEEN FLANGES

4 FOR O.S.&Y. SPECIFICATIONS; SEE APPENDIX C

5 FOR GATE VALVE AND BALL VALVE SPECIFICATIONS; SEE APPENDIX D AND E

6 PROVIDE AMPLE RIGID SUPPORT UNDER PIPING AND AROUND WATER METER SUCH THAT THE ENTIRE SETTING IS STRUCTURALLY STABLE WITH THE METER REMOVED, MINIMALLY AT THE FOLLOWING LOCATIONS: AT THE MID-POINT OF THE STRAIGHT SPOOL PIECE BEFORE THE METER, UNDER THE OUTLET VALVE, AND AT EACH BEND OF THE BY-PASS PIPING. ADDITIONAL LOCATIONS MAY BE NECESSARY TO ACHIEVE STRUCTURAL STABILITY.

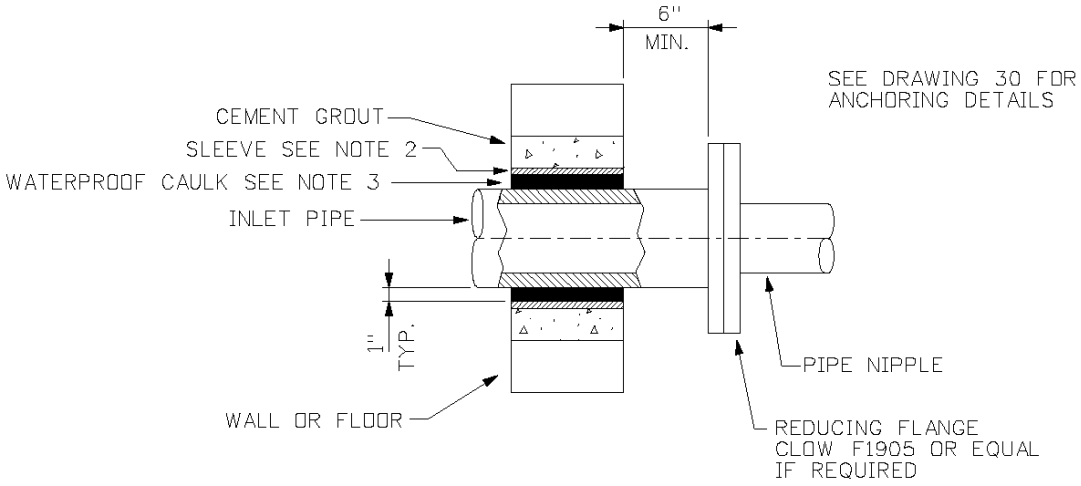
7 BY-PASS MAY BE PLACED OVERHEAD, WITH 5'-6" TO 6'-6"℄ OF BY-PASS TO ℄ OF METER CLEARANCE.

8 METER SHALL IMMEDIATELY FOLLOW THE STRAIGHT SPOOL PIECE, THE TEST TEE SHALL IMMEDIATELY FOLLOW THE METER AND THE OUTLET VALVE SHALL IMMEDIATELY FOLLOW THE TEST TEE.

MILWAUKEE water works Technical Services Group

DESCRIPTION:
NOTES – METER SETTING FULL FLOW FIRE METER IN A PIT

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 28N



NOTES:

1 INSTALLATION SHOWN APPLIES TO DUCTILE IRON PIPE THROUGH THE FLOOR OR WALL.

2 SLEEVE SHALL BE MADE OF STAINLESS STEEL, PVC, OR OTHER APPROVED MATERIAL

3 WATERPROOFING SHALL BE A WATERPROOF CAULK OR A COMPOUND EQUIVALENT TO "DUXSEAL" OR OTHER APPROVED METHOD OF WATERPROOFING SERVICE PIPE ENTRY.

4 MINIMUM CLEARANCE OF SIX INCHES SHALL BE PROVIDED BETWEEN SERVICE PIPE AND ANY INTERSECTING OBSTRUCTIONS.

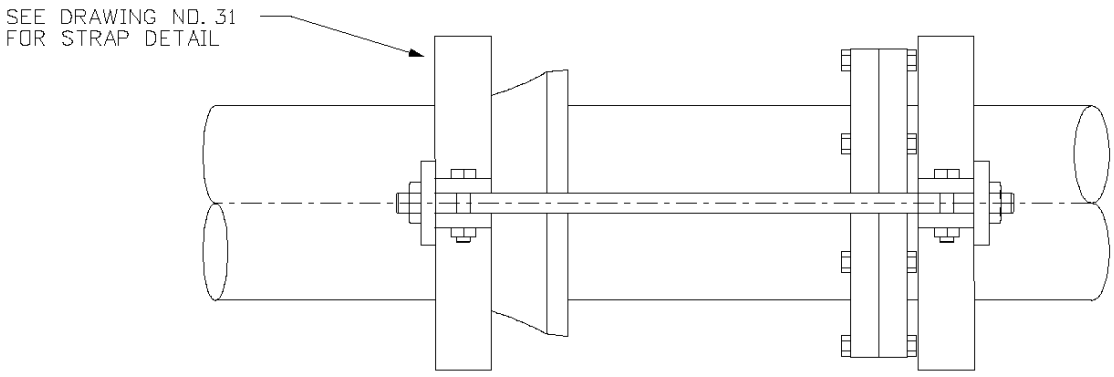
5 SLEEVE AND GROUT NOT REQUIRED IF HOLE IS CORE DRILLED TWO INCHES LARGER IN DIAMETER THAN PIPE DIAMETER.

MILWAUKEE water works Technical Services Group

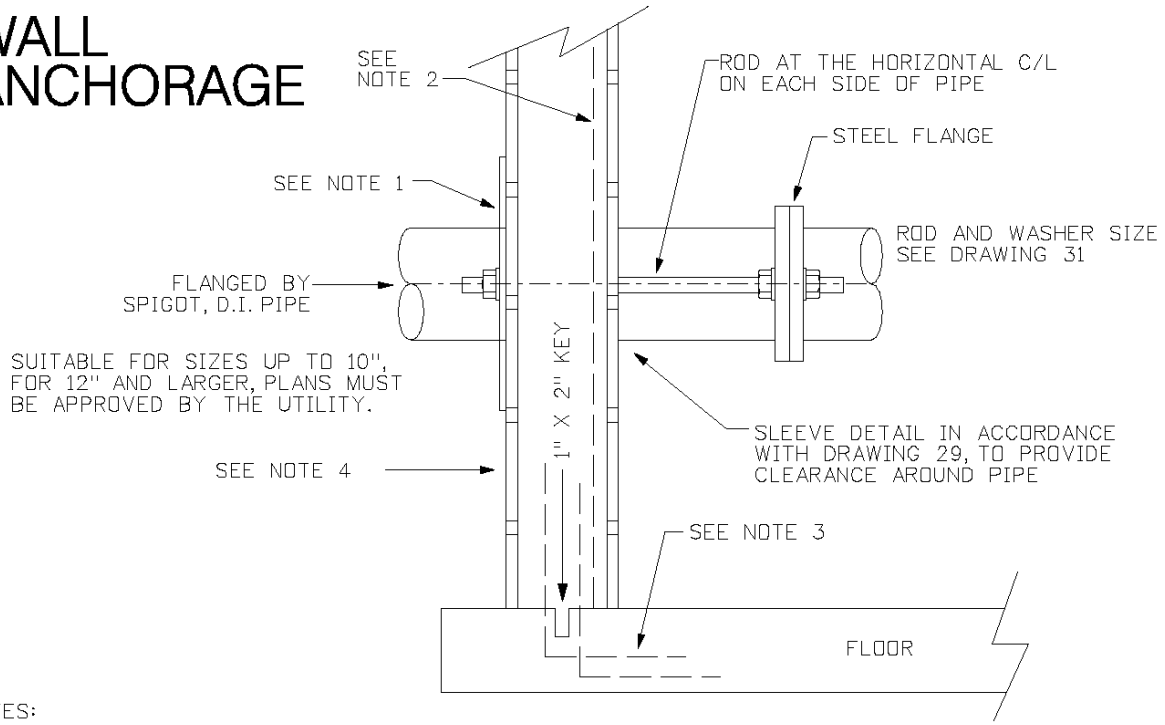
DESCRIPTION:
WATER SERVICE PIPING THROUGH WALL/FLOOR

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 29

FLANGED BELL AND SPIGOT ADAPTER



WALL ANCHORAGE



NOTES:

1 6"X18"X½" STEEL PLATE, EACH SIDE OF PIPE WITH HOLE DRILLED TO ALIGN WITH HOLE AT HORIZONTAL C/L OF FLANGE, SET IN ½" THICK GROUT BED.

2 3 -#5 REINFORCING BARS, IN EACH PIPE BLOCK, EXTENDING INTO ROOF SLAB.

3 6 -#5 REINFORCING ROD DOWELS, 1'-6" X 10" SET IN CONCRETE FLOOR AND EXTENDING INTO PIPE BLOCK.

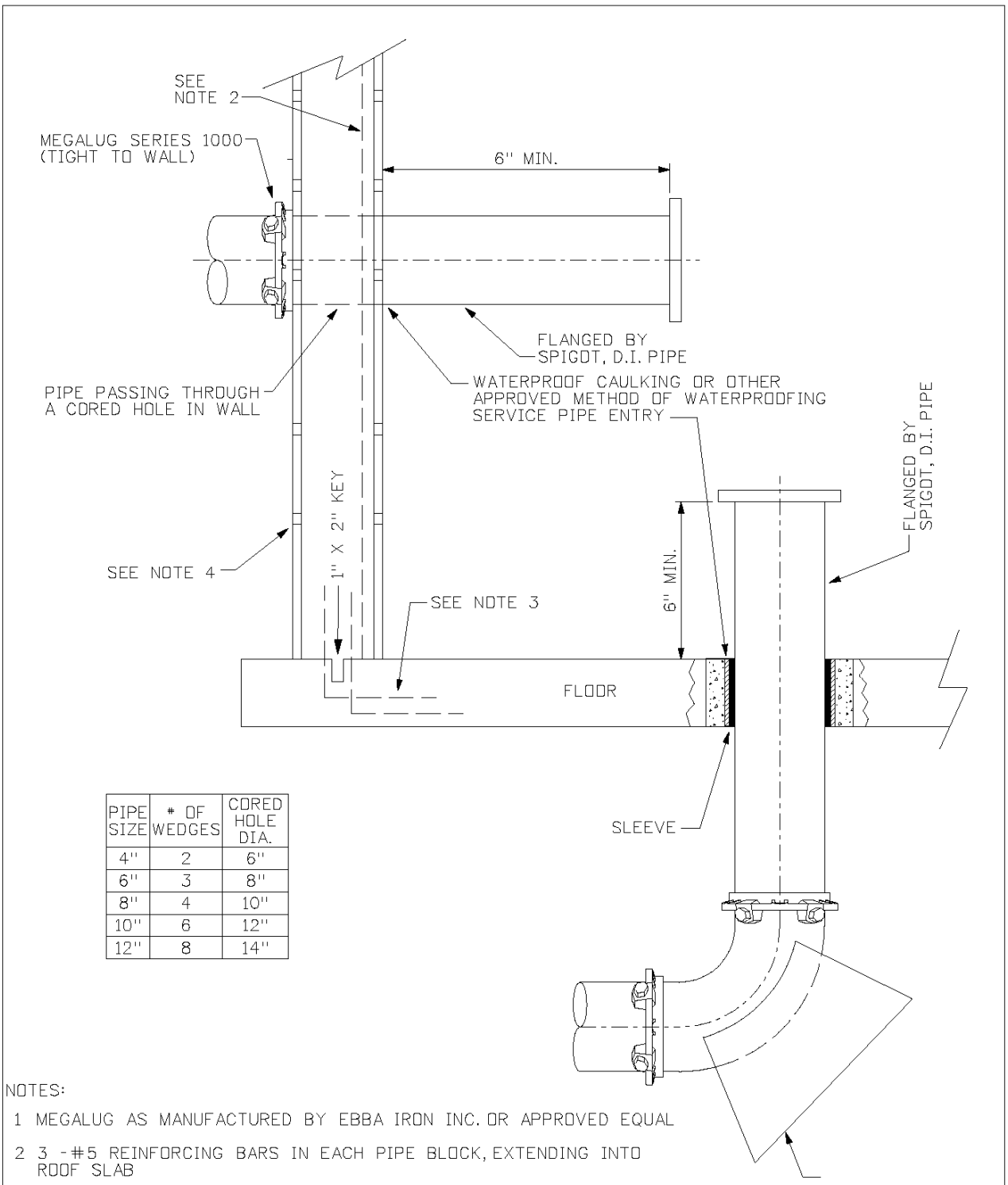
4 12" PIPE BLOCK ADJACENT TO EACH SIDE OF SLEEVE, FILL BLOCKS WITH CONCRETE. CONCRETE FILL SHALL BE CITY OF MILWAUKEE CLASS - C (SEE 4.5.1. OF WATER MAIN INSTALLATION SPECIFICATIONS - 1987)

5 PAINT RODS WITH A RUST RESISTANT COATING

MILWAUKEE water works Technical Services Group

DESCRIPTION: **ANCHORING DETAILS**

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 30



PIPE SIZE	# OF WEDGES	CORED HOLE DIA.
4"	2	6"
6"	3	8"
8"	4	10"
10"	6	12"
12"	8	14"

NOTES:

1 MEGALUG AS MANUFACTURED BY EBBA IRON INC. OR APPROVED EQUAL

2 3 -#5 REINFORCING BARS IN EACH PIPE BLOCK, EXTENDING INTO ROOF SLAB

3 6 -#5 REINFORCING ROD DOWELS, 1'-6"x10" SET IN CONCRETE FLOOR AND EXTENDING INTO PIPE BLOCK

4 12" PIPE BLOCK ADJACENT TO EACH SIDE OF SLEEVE, FILL BLOCKS WITH CONCRETE. CONCRETE SHALL BE CITY OF MILWAUKEE CLASS C (SEE 5.5.1 OF WATER MAIN INSTALLATION SPECIFICATION- 1987)

5 SLEEVE SHALL BE MADE OF STAINLESS STEEL, PVC OR OTHER APPROVED MATERIAL

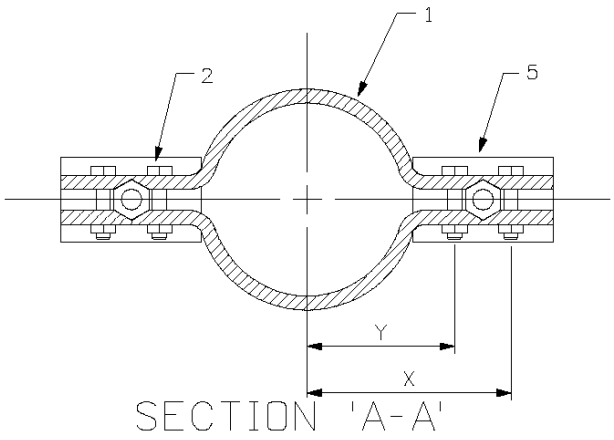
6 WATERPROOFING SHALL BE A WATERPROOF CAULK OR A COMPOUND EQUIVALENT TO "DUXSEAL" OR OTHER APPROVED METHOD OF WATERPROOFING SERVICE ENTRY PIPE.

MILWAUKEE water works Technical Services Group

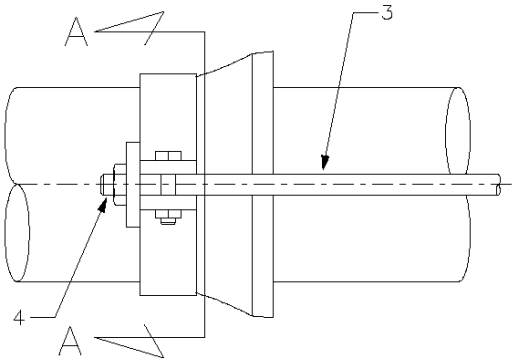
DESCRIPTION:
MEGALUG ANCHORING DETAILS

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 30A

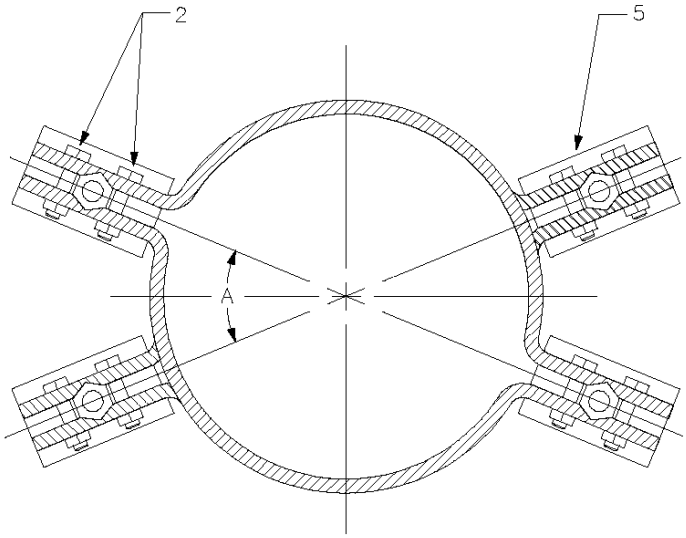
STRAPPING FOR 4"–10" DIA. WATER MAINS



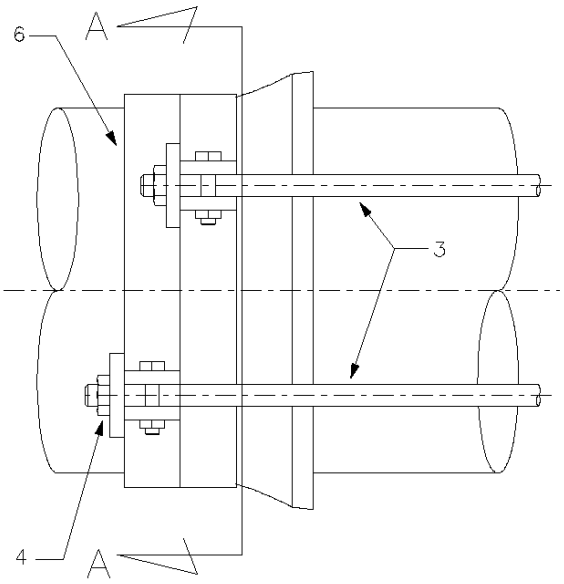
SECTION 'A-A'



STRAPPING FOR 12"–16" DIA. WATER MAINS



SECTION 'A-A'



PARTS LIST

1 ½" X 2" RETAINER CLAMP
2 ½" X 3½" BOLT
3 THREADED ROD
4 NUT
5 ½" X 3" X 5" WASHER
6 SECOND RETAINER CLAMP (12" AND 16" ONLY)

PIPE SIZE	PIPE O.D.	NO. RODS	ROD DIA.	Z	X	A
3"	3.96"	2	¾"	3.75"	5.75"	-
4"	4.80"	2	¾"	4.25"	6.25"	-
6"	6.90"	2	¾"	5.25"	7.25"	-
8"	9.05"	2	¾"	6.50"	8.50"	-
10"	11.70"	2	¾"	7.75"	9.75"	-
12"	13.20"	4	1"	8.75"	10.75"	45°
16"	17.40"	4	1¼"	10.75"	12.75"	30°

NOTES:

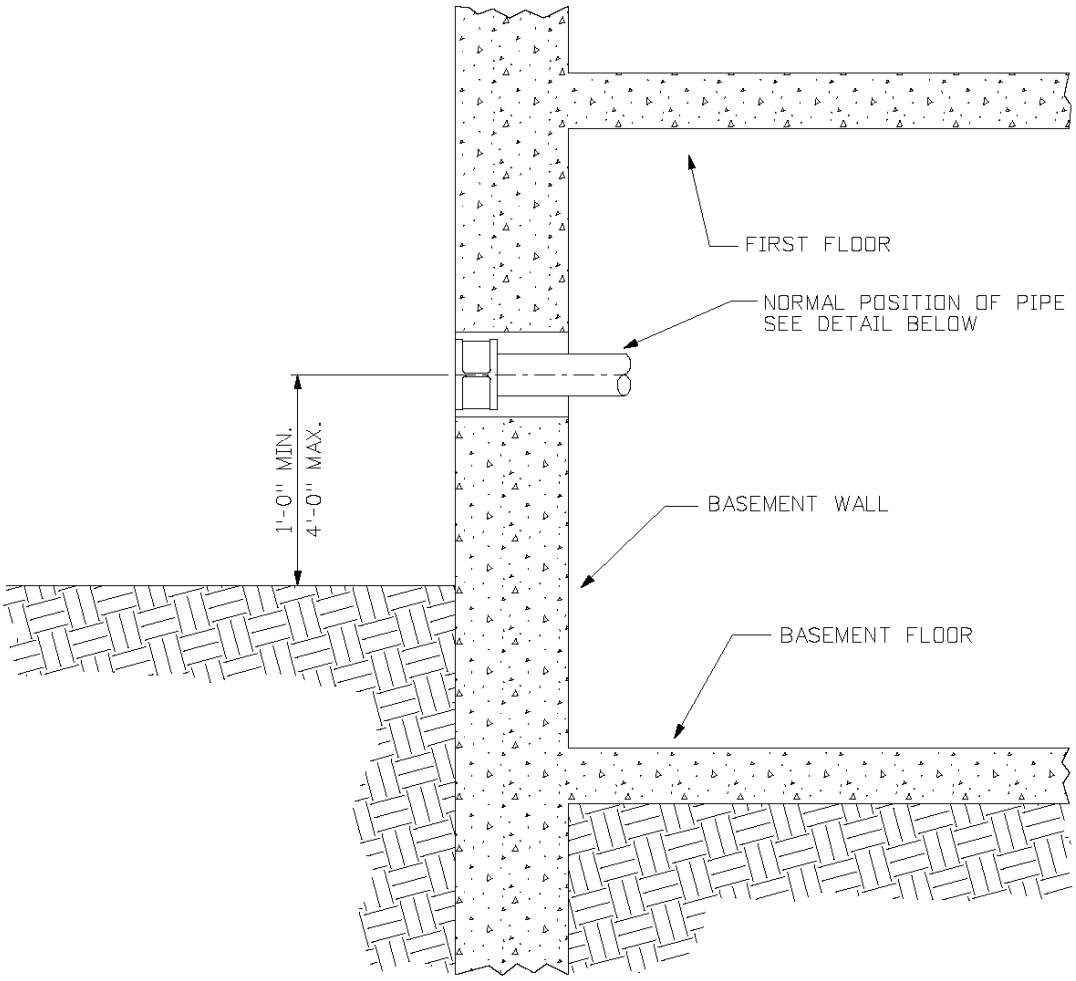
1 AFTER ASSEMBLY, ALL FERROUS MATERIALS SHALL BE PAINTED WITH A RUST RESISTANT COATING

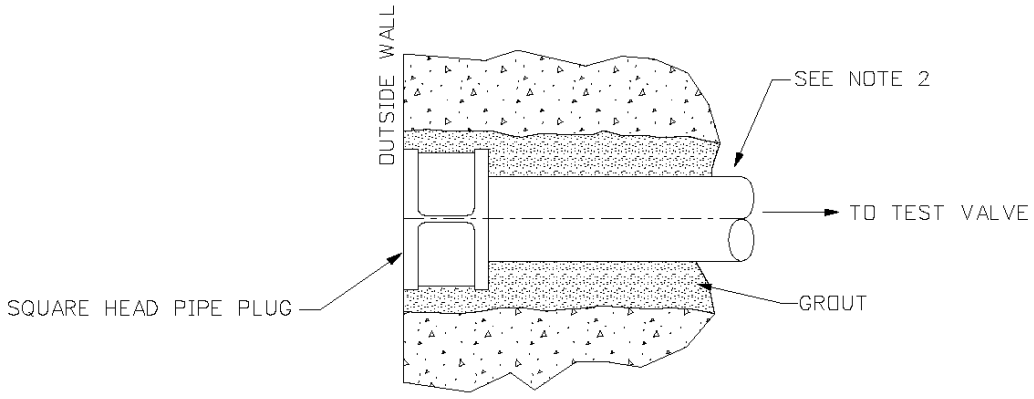
2 ALL MATERIALS SHALL BE IN ACCORDANCE WITH APPENDIX M

MILWAUKEE water works Technical Services Group

DESCRIPTION: **STRAPPING DETAILS**

DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 31





NOTES:

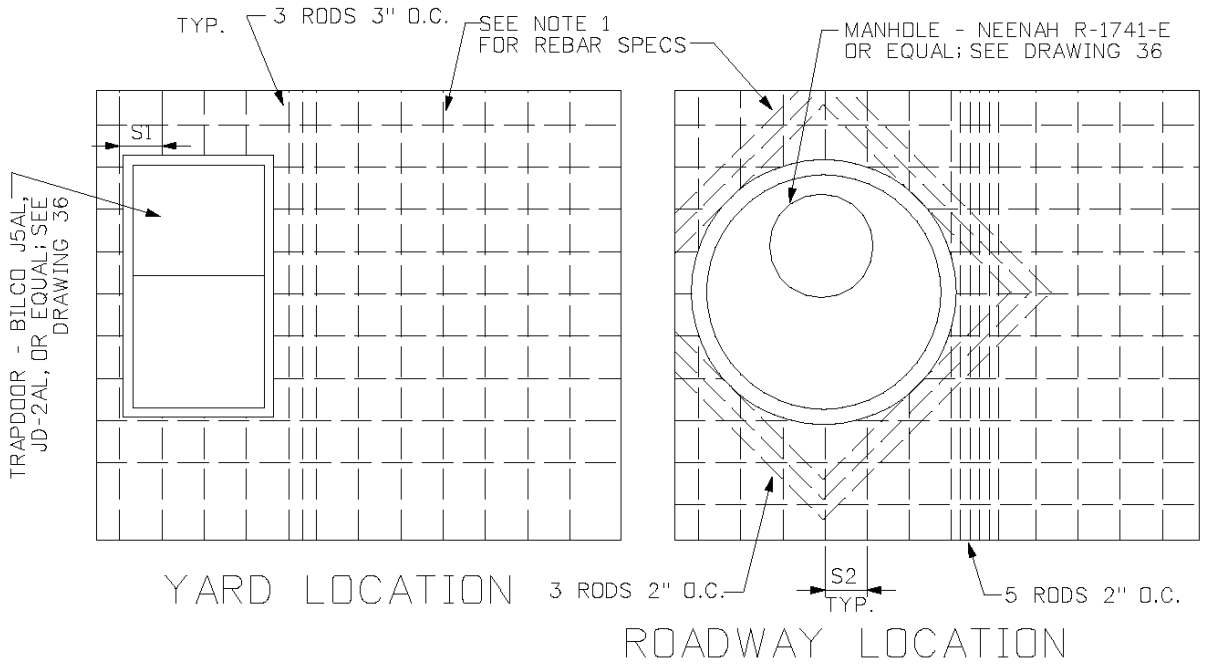
1 MATERIALS
A) PIPE - BRASS OR TYPE K OR L - COPPER
B) PLUG - BRASS

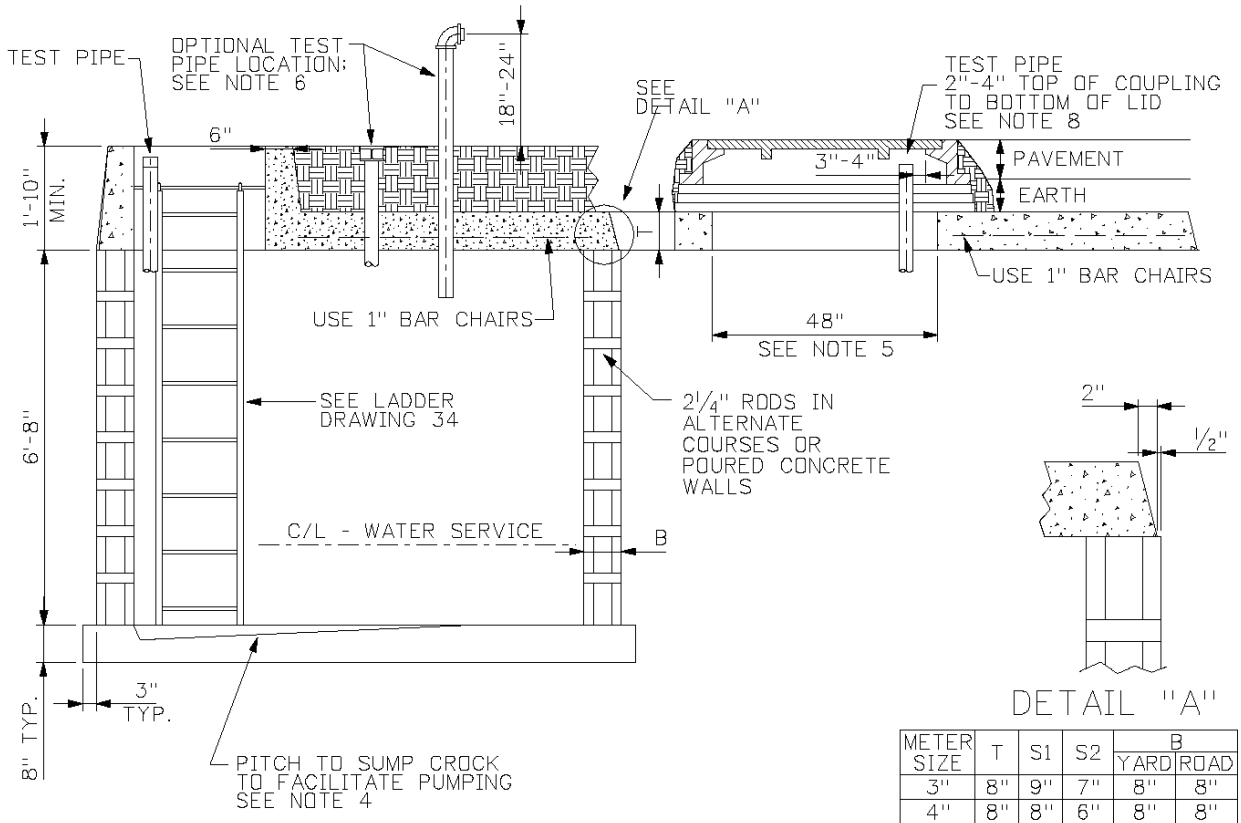
2 CONCEALED PIPE SHALL BE SAME SIZE AS TEST VALVE.

MILWAUKEE water works — Technical Services Group

DESCRIPTION:
METER TEST CONNECTION OR EMERGENCY DISCONNECTION ON A BUILDING

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 32





DETAIL "A"

METER SIZE	T	S1	S2	B	
				YARD	ROAD
3"	8"	9"	7"	8"	8"
4"	8"	8"	6"	8"	8"
6"	8"	7"	5"	8"	12"
8"	10"	6"	5½"	8"	12"
10"	10"	5"	4½"	8"	12"

MILWAUKEE water works Technical Services Group

DESCRIPTION:
METER PIT SPECIFICATIONS

DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 33

FOR NOTES REFERENCED ON THIS DRAWING, SEE DRAWING 33N

NOTES:

1 MATERIAL
   A) CONCRETE IN ROOF IS CLASS "C" CITY OF MILWAUKEE
   B) ALL REINFORCING RODS IN: ROOF -5/8" DIA. SIDES -1/4" DIA.

2 FINAL GRADING AROUND PIT SHALL BE SUCH THAT THERE IS NO DRAINAGE INTO PIT.

3 WALLS OF METER PIT SHALL BE WATER-PROOFED IN A MANNER SUCH THAT GROUND WATER DOES NOT ENTER THE STRUCTURE.

4 PIT DRAINAGE - PROVIDE SUMP PUMP AND DISCHARGE TO GRADE OR TO STORM SEWER. SUMP MAY DRAIN TO STORM SEWER IF A SEWER CHECK VALVE IS INSTALLED.

5 HOLD INSIDE CHIMNEY DIMENSION THROUGH ENTIRE HEIGHT.

6 FOR OPTIONAL TEST PIPE LOCATION, PIPE SHALL BE ADEQUATELY SUPPORTED AND THE PENETRATION THROUGH THE PIT TOP SHALL BE WATERPROOF. A VALVE BOX AND COVER MAY BE USED WHEN CONNECTION IS TERMINATED AT GRADE

7 ALTERNATE CONFIGURATIONS MATERIALS SHALL BE ALLOWED UPON APPROVAL OF MILWAUKEE WATER WORKS

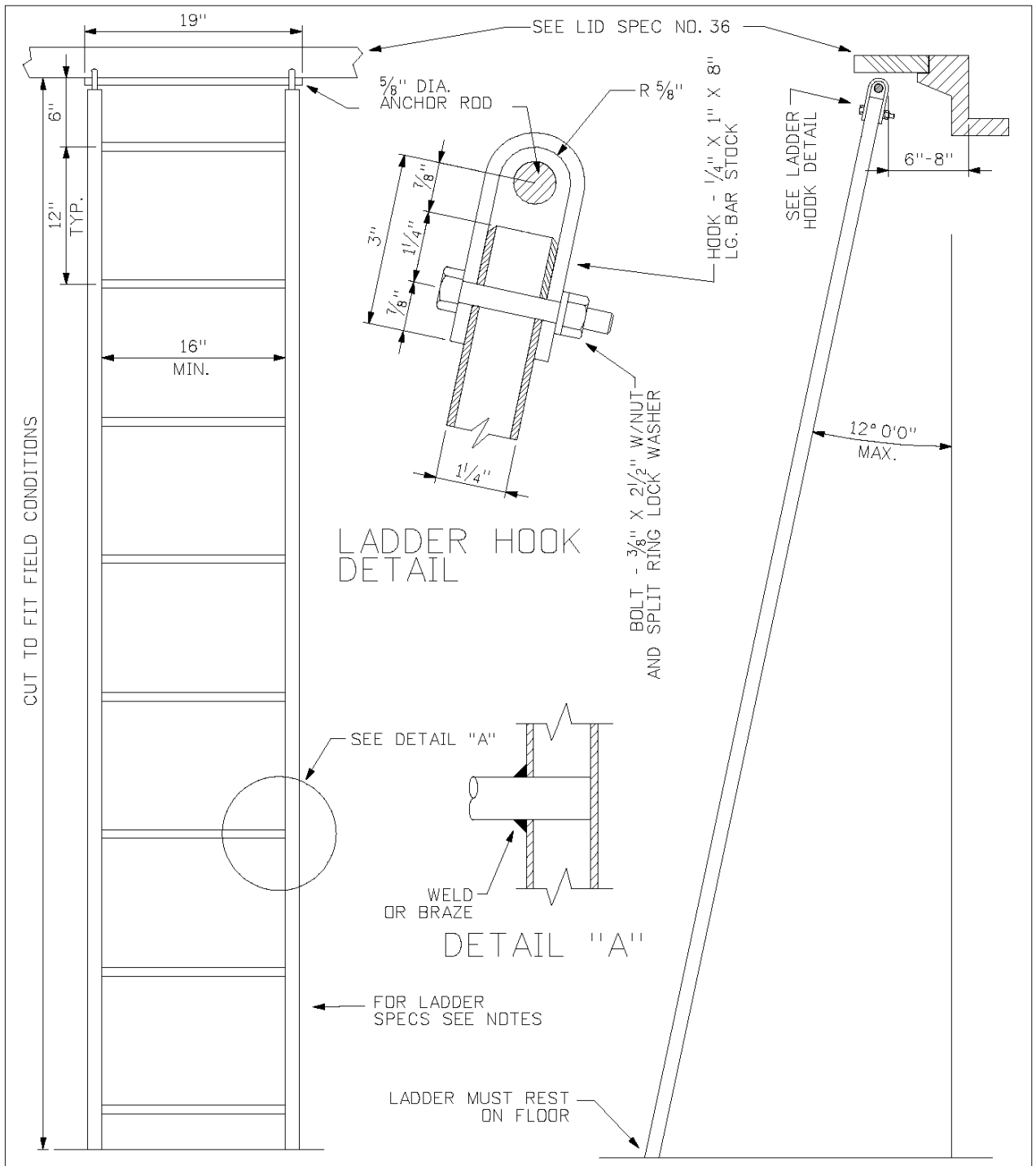
8 TEST PIPE SHALL BE INSTALLED SUCH THAT THERE IS ADEQUATE SPACE TO INSTALL AN EQUAL SIZE RISER PIPE TO SERVICE METER AFTER THE MANHOLE FRAME IS INSTALLED.

9 THE SUMP CROCK SHALL BE PLACED NEAR THE PIT OPENING, ALONG THE NEAREST WALL, AND IN A LOCATION SUCH THAT IT DOES NOT POSE A HAZARD DURING USE OF THE LADDER.

MILWAUKEE water works — Technical Services Group

DESCRIPTION:
NOTES – METER PIT SPECIFICATIONS

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 33N



NOTES:

1 STRINGERS 1¼" SQUARE ⅛" WALL TUBING OR 1¼" SCHEDULE 40 PIPE MIN. DESIGN LIVE LOAD SHALL BE A SINGLE CONCENTRATED LOAD OF 200 POUNDS.

2 RUNGS ¾" DIA. BAR STEEL MIN.

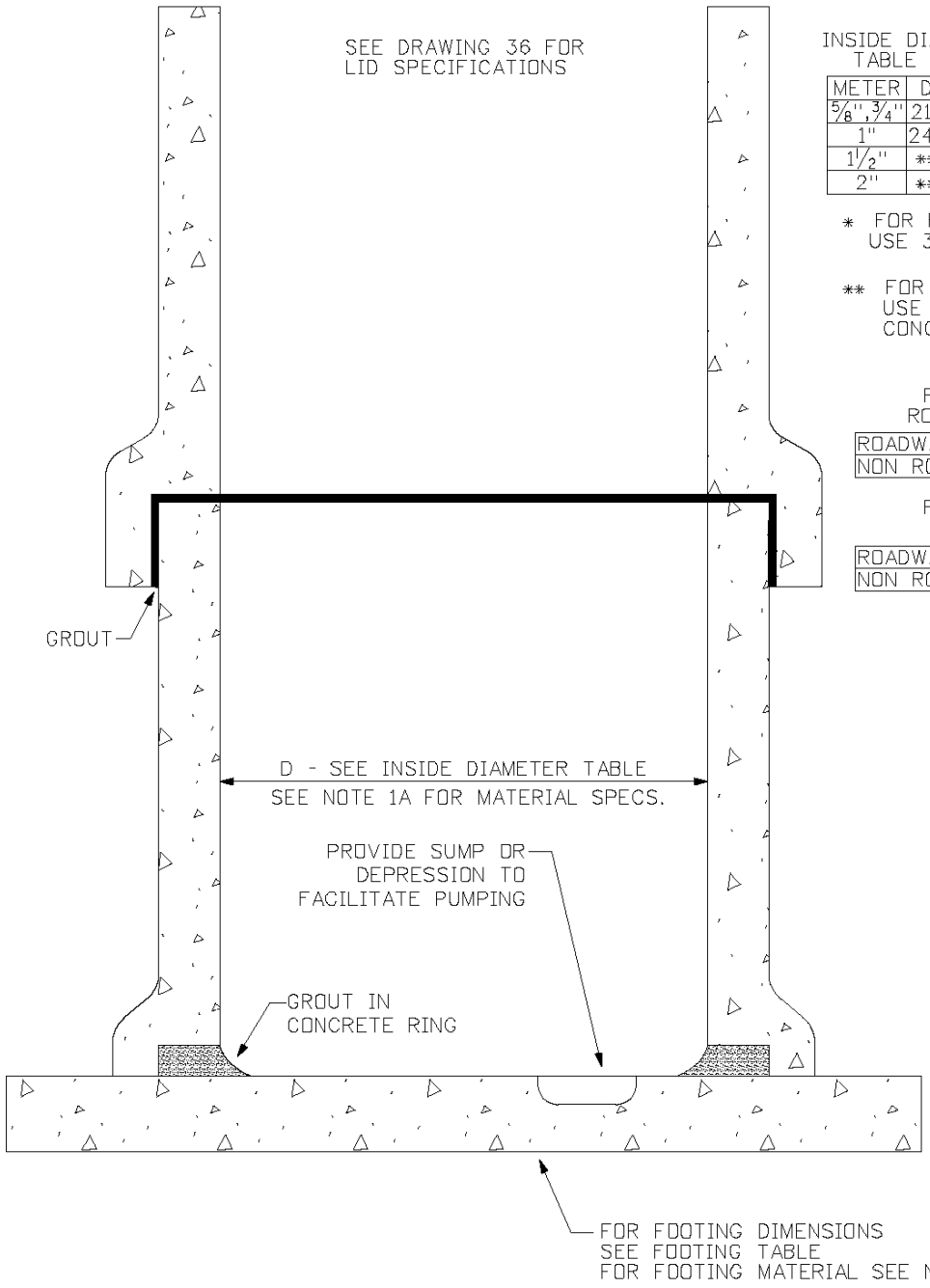
3 FABRICATE LADDER BY WELDING; GALVANIZED OR EQUAL PROTECTIVE COATING REQUIRED.

4 LADDER SHALL COMPLY WITH OSHA STANDARD - CHAPTER XVII PART 1910, SUBPART D, SEC. 1910.27 AND APPLICABLE SECTIONS OF THE WISCONSIN ADMINISTRATIVE CODE - DEPARTMENT OF COMMERCE CHAPTER COMM 32.

MILWAUKEE water works Technical Services Group

DESCRIPTION: **LADDER SPECIFICATIONS**

DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 34



INSIDE DIA. TABLE

METER	D	
5/8", 3/4"	21"	*
1"	24"	*
1 1/2"	**	
2"	**	

LAWN SPRINKLER INSIDE DIA. TABLE

METER	D
5/8", 3/4", 1"	36"
1 1/2"	36"
2"	36"

* FOR ROADWAY INSTALLATION USE 36" DIAMETER

** FOR 1 1/2" AND 2" METERS USE 48"X48" SINGLE CELL CONCRETE BOX CULVERT

FOOTINGS TABLE
ROUND SEWER PIPE

ROADWAY	60"SQ. X 9" DP.
NON ROADWAY	60"SQ. X 5" DP.

FOOTINGS TABLE
BOX CULVERT

ROADWAY	NOT ALLOWED
NON ROADWAY	72"SQ. X 5" DP.

NOTES:

1 MATERIAL:
- A) PIPE - REINFORCED CONCRETE SEWER PIPE ASTM C-76 CLASS II WITH A LAYING LENGTH OF 36" (LONGER PIPE SECTIONS ARE ACCEPTABLE)
- B) BOX CULVERT - IN ACCORDANCE WITH ASTM C789/C850, LAYING LENGTH 36" MINIMUM
- C) FOOTING - CONCRETE SHALL BE CITY OF MILWAUKEE - CLASS D

2 INSTALLATION MUST PROVIDE GRADING TO PREVENT DRAINAGE INTO THE WELL.

3 WELL SHALL BE CONSTRUCTED AS TO PREVENT ACCUMULATION OF SURFACE WATER

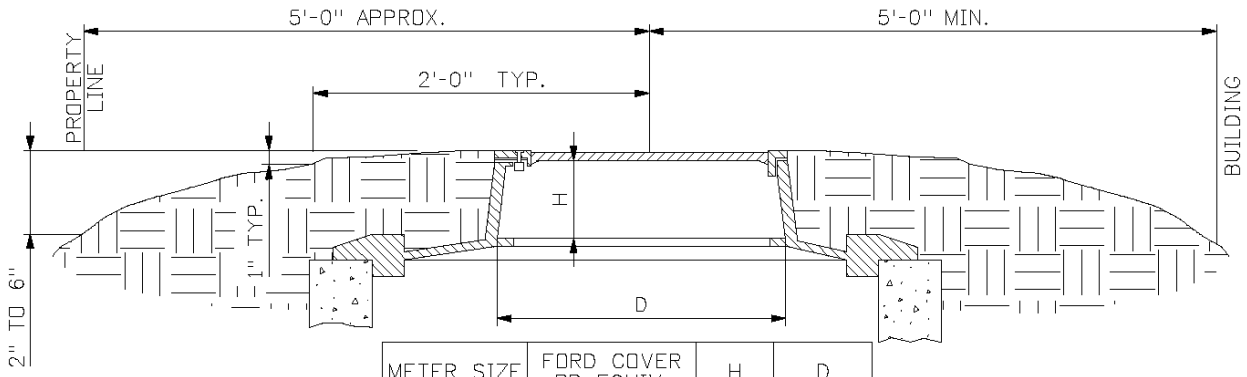
4 ALTERNATE CONFIGURATIONS AND MATERIALS MAY BE ALLOWED UPON APPROVAL OF THE MILWAUKEE WATER WORKS

MILWAUKEE water works — Technical Services Group

DESCRIPTION: **METER WELL SPECIFICATIONS**

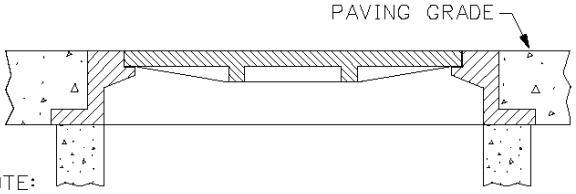
DRAWN BY: SPM	DATE: 6-12-2002	DRAWING NO.: 35

WELL TYPE LID – NON ROADWAY



METER SIZE	FORD COVER OR EQUIV.	H	D
5/8",3/4"	C4	4"	11 1/2"
1"	MC-24	7 1/2"	20"
1 1/2"	MC-36-MB	8"	20"
5/8" TO 1" LAWN SPRINKLERS	MC-36-MB	8"	20"

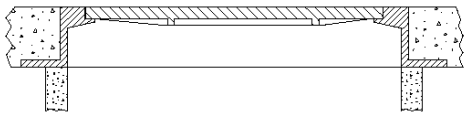
PIT TYPE LID FOR ROADWAY



NOTE:

MANHOLE FRAME AND COVER:
NEENAH FOUNDRY R-1741-E
OR EQUAL WITH OFF CENTER
ACCESS LID TO ALIGN WITH
LADDER FASTENED TO PIT WALL

WELL TYPE LID FOR ROADWAY (5/8", 3/4" AND 1" METERS)



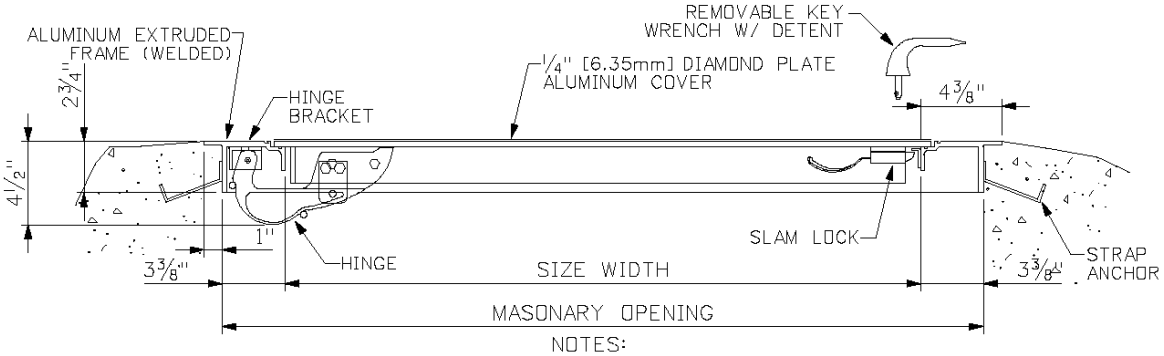
NOTES:

1 MANHOLE FRAME AND COVER:
NEENAH FOUNDRY R-1740-B OR EQUAL.
COVER TO HAVE TYPE F PICK HOLES.

2 FOR 5/8",3/4" AND 1" METERS

PIT TYPE AND WELL TYPE (1-1/2" AND 2" METERS) NON-ROADWAY

ILLUSTRATION SHOWS A BILCO TYPE K

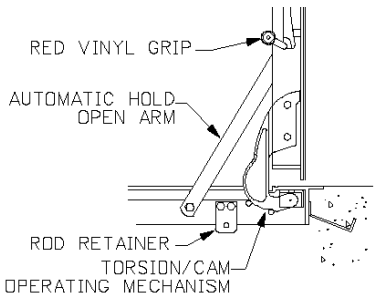


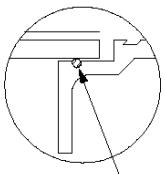
NOTES:

1 FOR 1 1/2" AND 2" METERS IN A YARD LOCATION, USE A BILCO TYPE K FLOOR VAULT, AND SIDEWALK DOOR OR EQUAL

2 FOR LARGE VAULTS USE BILCO J5AL, JD-2AL, OR EQUAL

3 INSTALLATION SHALL BE PER MANUFACTURER'S SPECIFICATIONS





MILWAUKEE water works Technical Services Group

DESCRIPTION: **LID CONFIGURATIONS**

DRAWN BY: SPM | DATE: 6-12-2002 | DRAWING NO.: 36

MILWAUKEE WATER WORKS

WATER SERVICE PIPING SPECIFICATIONS

Chapter 5
Appendix

MATERIAL SPECIFICATIONS
Section 5.1 .0

APPENDIX A	Cast Iron Service Boxes
APPENDIX B	Cast Iron Valve Boxes
APPENDIX C	Iron Body Gate Valves - 3" to 12"
APPENDIX D	Bronze Gate Valves, ¾" through 2"
APPENDIX E	Bronze Ball Valves ¾" to 2"
APPENDIX F	Meter Setting Pipe (Copper, Brass, Steel, and Ductile Iron)
APPENDIX G	Meter Horn 5/8", 5/8" X ¾", ¾" and 1"
APPENDIX H	Pipe Repair Clamps - Stainless Steel
APPENDIX I	Specifications For Fittings, Gray Iron Or Ductile Iron, Lead, Flange Or Rubber Gasket Joints
APPENDIX J	Ductile Iron Pipe (Rubber Gasket joints)
APPENDIX K	Double Detector Check Valve Assemblies
APPENDIX L	Polyethylene Film
APPENDIX M	Thrust Restraint Material (Including drawings)
APPENDIX N	Compression Type Fittings Used on Copper and/or Lead Service Piping
APPENDIX O	Bronze Check Valves
APPENDIX P	Iron Check Valves

APPENDIX A

SPECIFICATION FOR CAST IRON SERVICE BOXES

CAST IRON (BUFFALO PATTERN)

City of Milwaukee
Specification No. 30-C-1
January 23, 1995
(W.E.D. No. 7B-P-1/95)

I. GENERAL REQUIREMENTS

The latest version of City of Milwaukee Specification No. 70b-D-7, on file with the Department of Administration - Purchasing shall apply except as modified in the technical requirements as described herein.

II. TECHNICAL REQUIREMENTS

A. Description

A service box is installed to provide access to the operator of a direct buried curb stop. Service boxes specified herein shall be screw type.

A Service Box – Complete, shall consist of a base section, top section with cover and, if necessary, one intermediate extension section, to achieve a nominal length of seven feet.

The top section shall be designed to thread onto the base or extension section so that the length of the unit can be continuously variable within the range specified. Additional extension sections designed to fit on the base shall be used to achieve a service box length in excess of seven feet. The top section shall be designed to receive a circular cover that can be bolted in place.

B. Material

The service box and component parts shall be cast iron in accordance with ASTM-A48 Class 20 or approved equal.

C. Service Box Design

The service box and component parts shall be of the "Buffalo Pattern" design as shown in drawings SB-1 through SB-5 and SB-11 through SB-15. The service box shall be a 2-1/2 inch or 3-inch diameter unit, screw type, cast iron, in accordance with the following requirements:

1. The 2-1/2 inch diameter base section shall be constructed in accord with drawing SB-2. An enlarged base adapter, for curb stops up to 2", shall be constructed in accord with drawing SB-

10. The 3 inch diameter base section shall be constructed in accord with drawing SB-12.

2. The standard service box retracted length shall be 63" maximum and the extended length shall be 82" minimum. The 30" long nominal top section shall be between 28" and 32" in length. The base section may be composed of two castings to provide the overall length required. The intermediate extension section, if furnished, shall be of sufficient length to allow the top section to be turned down the required distance without interruption.

3. The nominal length of service box extensions shall be the length specified on the bid form.

4. The cover shall be the standard drop type with locking plate and bolt or repair-drop type cover with scissors lock and bolt. The word "WATER" shall be cast in the top of the service box cover. The cover bolt shall be brass a pentagon head of the manufacturers thread design and length.

D. Tolerances

The service box and component parts shall be constructed within dimensional tolerances that shall assure interchangeability with service boxes manufactured in accord with the drawings. The minus tolerance for metal thickness shall not be more than 0.10 inch. An additional tolerance of 0.02 inch shall be permitted over areas not exceeding 8 inches in any direction.

E. Enlarged Base Adapter

The service box adapter as shown in drawing SB-10 is to adapt 2-1/2" service boxes for use over 2" curb stops. The adapter shall be furnished with the 3" maximum O.D. of the stem portion and the 3-3/4" minimum base clear opening as shown.

F. Workmanship and Finish

The cast iron service box and components shall be free from blowholes, cold shots, shrinkage defects, cracks, or other injurious defects, and shall have a normal smooth casting finish.

G. Coating

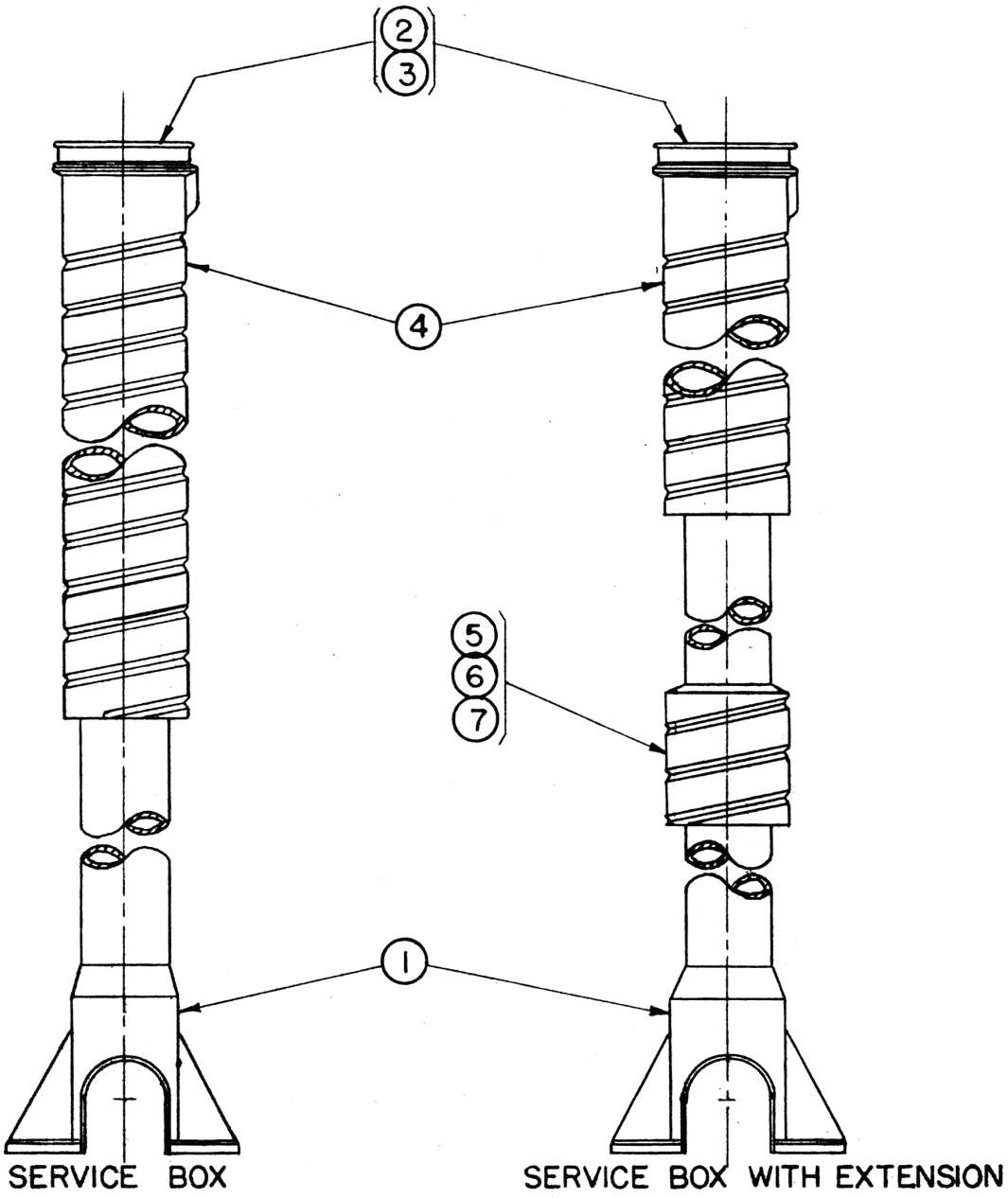
All cast iron service box component parts and cover shall be thoroughly coated with asphaltum pitch varnish or approved equal.

III. ROADWAY SERVICE BOXES

Curb stops located in roadway areas must be provided with roadway service boxes. When providing a roadway service box, use the top section and cover of a standard valve box in place of the top section and cover of a standard curb service box.

IV. INSPECTION

The Plumbing Inspector, or his duly authorized representative shall inspect Service Box Installations. The contractor shall provide at his own expense such facilities and assistance required to carry out the inspection. The Plumbing Inspector shall have the authority to reject any work, material and parts there of which do not comply with the requirements.



(1) BASE
(2) COVER
(3) BOLT
(4) TOP SECTION
(5)(6)(7) EXTENSIONS

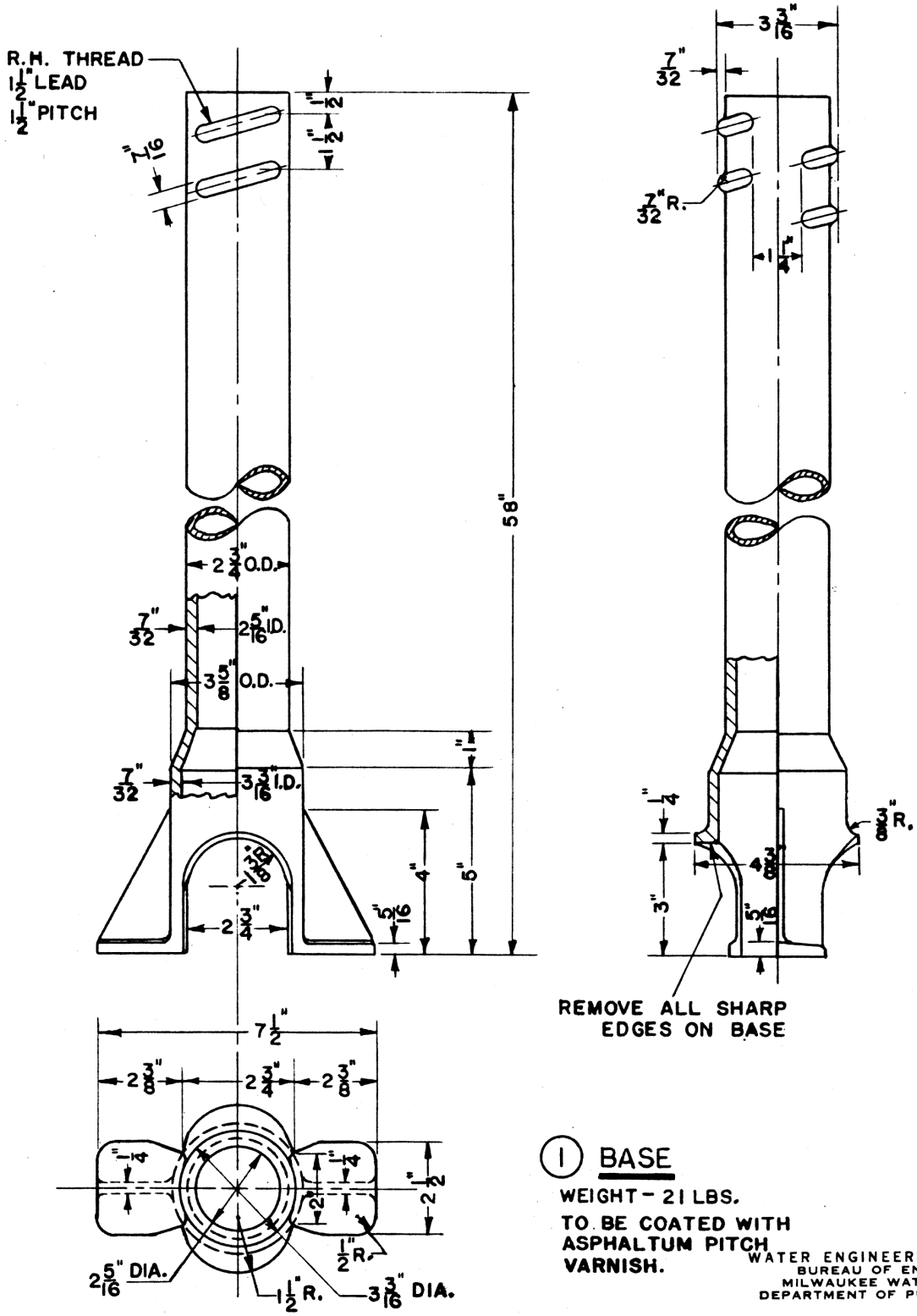
STANDARD		WITH EXTENSION	
RETRACTED	EXTENDED	RETRACTED	EXTENDED
61"	84"	89"	93"
-	-	89"	100"
-	-	89"	112"

WATER ENGINEERING DIVISION
BUREAU OF ENGINEERS
MILWAUKEE WATER WORKS
DEPARTMENT OF PUBLIC WORKS

SERVICE BOX (2 1/2") ASSEMBLY

A. Rynders — ENGINEER
Lloyd D. Knapp — CITY ENGINEER

DRAWN J.R.S.
CHECKED O.A.H.
FILE 3-6-53
DATE 1-16-53
SCALE 3/16"=1"
DWG. SB-1



(1) BASE

WEIGHT - 21 LBS.

TO BE COATED WITH ASPHALTUM PITCH VARNISH.

MATERIAL:
CAST IRON
A.S.T.M. A 48 CL. 20

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MILWAUKEE WATER WORKS
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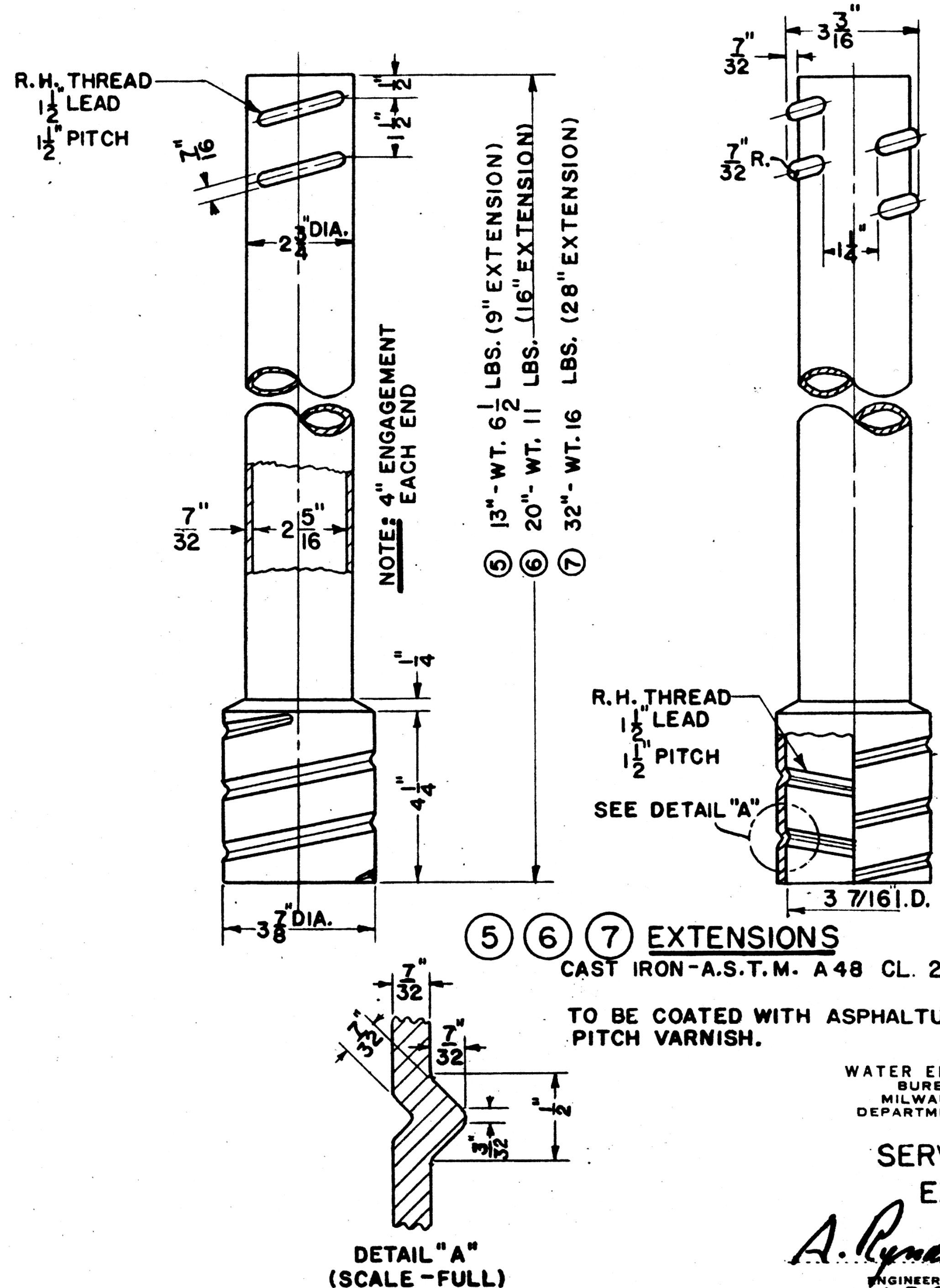
SERVICE BOX (2 1/2") BASE

A. Rynden ENGINEER — Lloyd D. Knapp CITY ENGINEER

DRAWN J.R.S. — DATE 1-16-53
CHECKED O.A.H. — SCALE 1/4"=1"
FILE 3-5-43 — DWG. SB-2



(5) (6) (7) EXTENSIONS

CAST IRON-A.S.T.M. A48 CL. 20

TO BE COATED WITH ASPHALTUM PITCH VARNISH.

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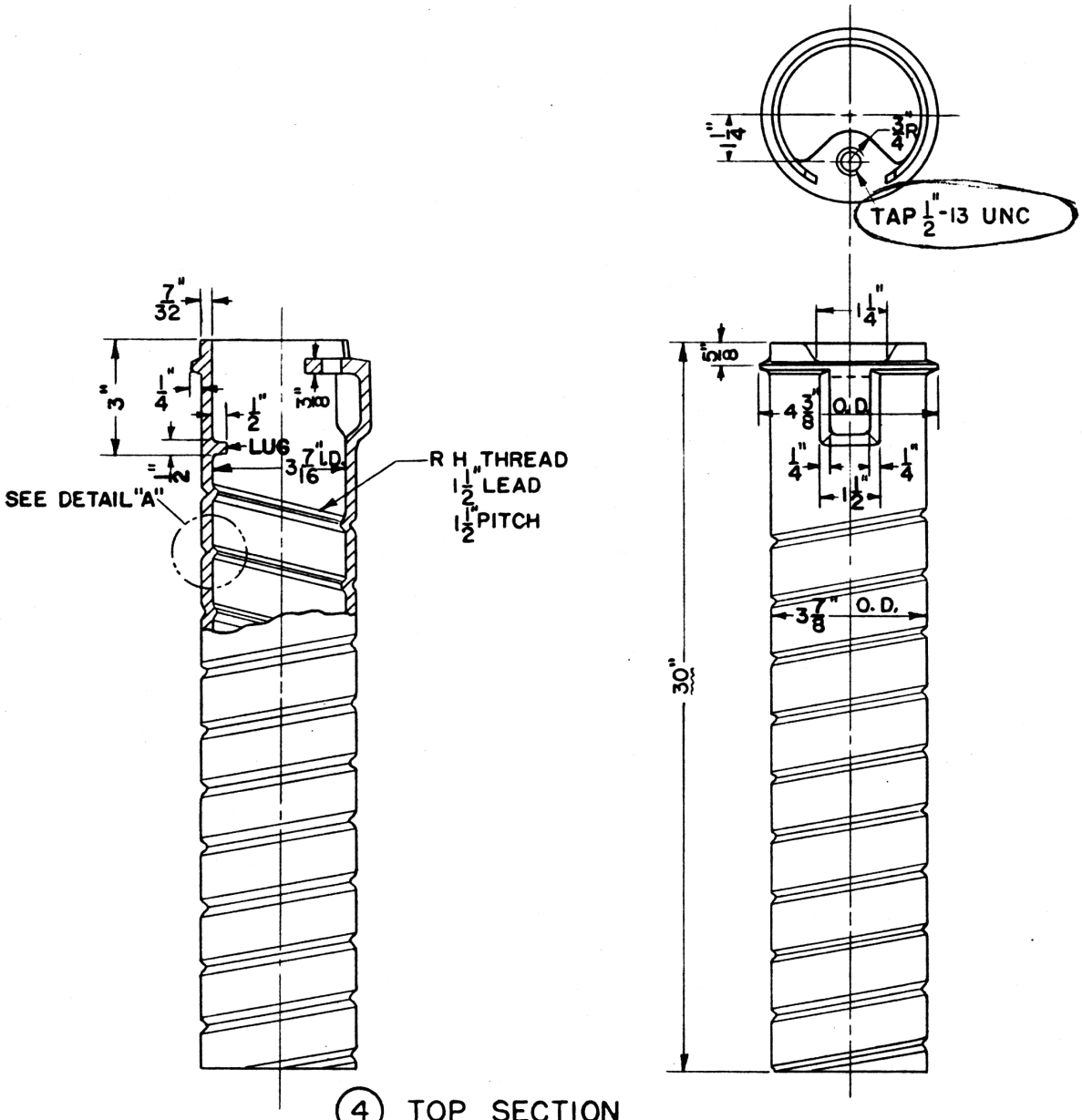
BUREAU OF ENGINEERS
MILWAUKEE WATER WORKS
DEPARTMENT OF PUBLIC WORKS

SERVICE BOX (2 1/2"
EXTENSION

A. Rynders   Lloyd D. Knapp
ENGINEER   CITY ENGIN

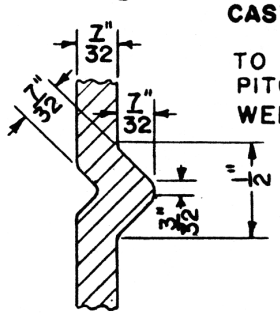
DRAWN J.R.S.   DATE 1-16-53
CHECKED O.A.H.   SCALE 1/4"=1"
FILE 3-5-83   DWG. SB-3



(4) TOP SECTION

CAST IRON-A.S.T.M. A 48 CL. 20

TO BE COATED WITH ASPHALTUM PITCH VARNISH.
WEIGHT 21 LBS.



DETAIL "A"
(SCALE - FULL)

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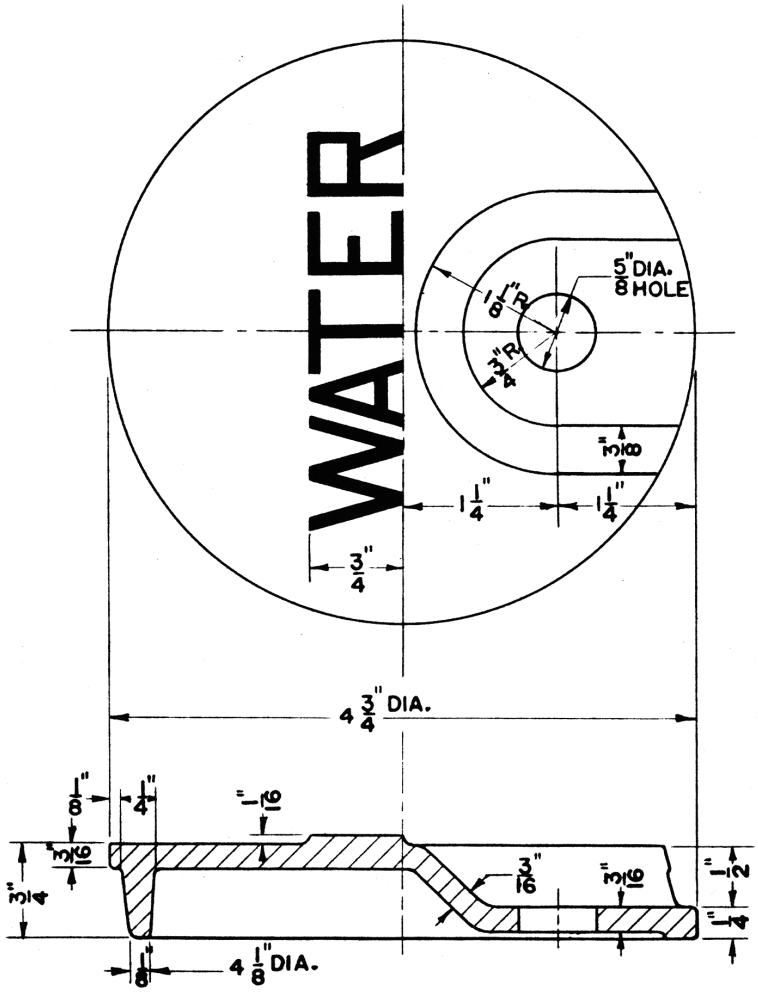
MILWAUKEE WATER WORKS
DEPARTMENT OF PUBLIC WORKS

SERVICE BOX (2 1/2"
TOP SECTION

A. Rynders — ENGINEER
Lloyd D. Kneg — CITY ENGIN

DRAWN J.R.S. DATE 1-16-53
CHECKED O.A.H, RH SCALE 1/4"=1"
FILE 3-5-43 DWG. S B - 4

REV. 3-12-73

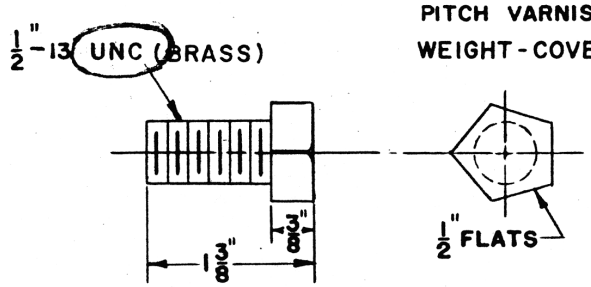


(2) COVER

CAST IRON - A.S.T.M. A 48 CL. 20

TO BE COATED WITH ASPHALTUM PITCH VARNISH.

WEIGHT - COVER & BOLT 1 1/2 LBS.



(3) PENTAGON HEAD BOLT

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BUREAU OF ENGINEERS
MILWAUKEE WATER WORKS
DEPARTMENT OF PUBLIC WORKS

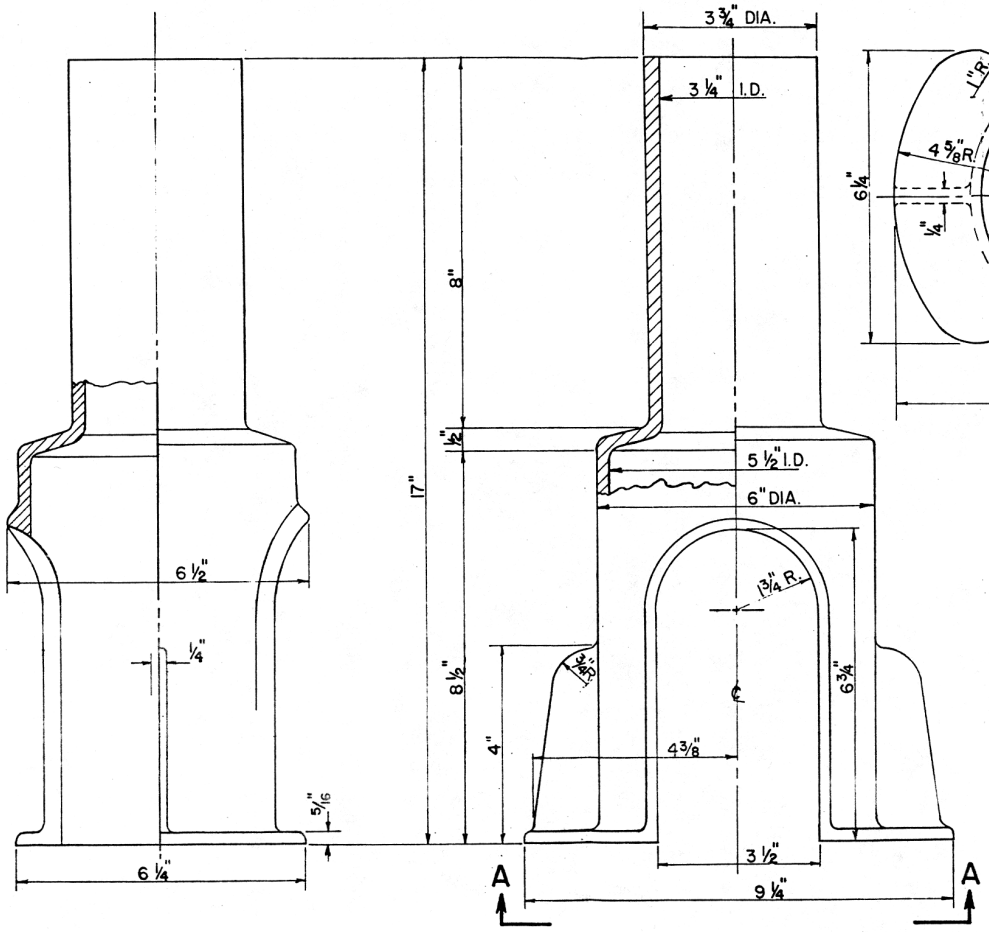
SERVICE BOX (2 1/2"
COVER AND BOLT

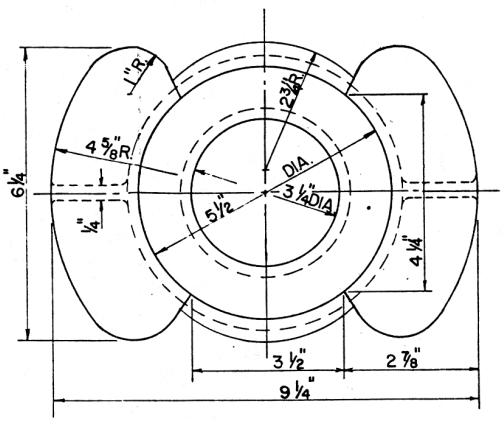
A. Rynders — Lloyd D. King
ENGINEER — CITY ENGINEER

DRAWN J.R.S. DATE 1-16-53
CHECKED O.A.H., P.H. SCALE 3/4"=1"
FILE 3-5-43 DWG. SB-5

REV. 3-12-73

A-4-78





VIEW A-A

NOTE:
USED OVER O-RING STOP
MAT.- C.I. A.S.T.M. A48-CL. NO. 20
COATING- ASPHALTUM PITCH VARNISH.

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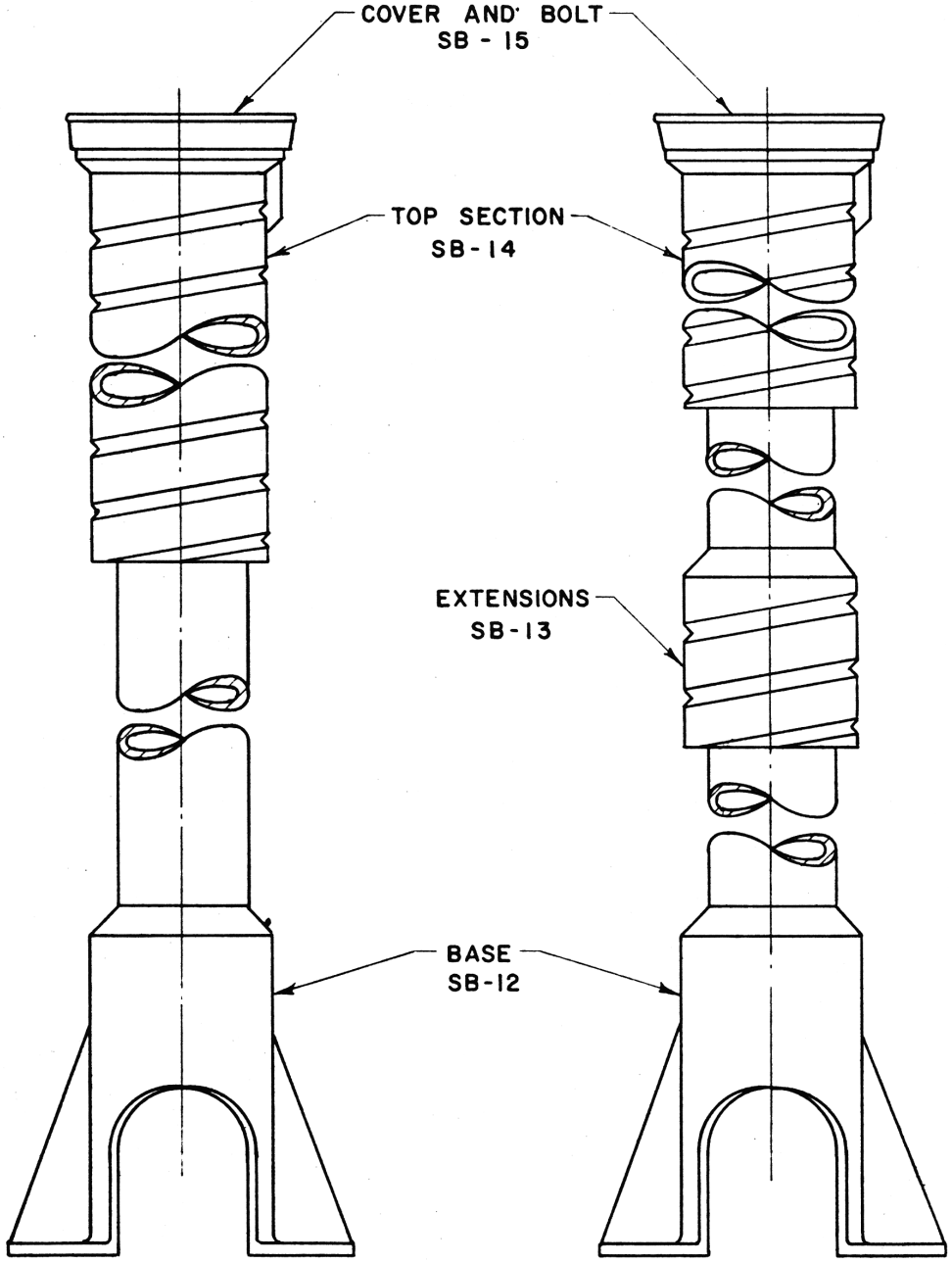
MILWAUKEE WATER WORKS
DEPARTMENT OF PUBLIC WORKS

ADAPTER
FOR USE WITH
3" SERVICE BOX

W. J. Hammann — ENGINEER
E. A. Schmidt — CITY ENGINEER

DRAWN M.C.K. - J.S. DATE 8-30-61
CHECKED O.A.H. SCALE 1/2" = 1"
FILE 3-10-18 DWG. SB-10



STANDARD SERVICE BOX

SERVICE BOX WITH EXTENSION

LENGTH OF SERVICE BOX		
	RETRACTED	EXTENDED
STANDARD SERVICE BOX	61"	84"
WITH 9" EXTENSION	89"	93"
WITH 16" EXTENSION	89"	100"
WITH 28" EXTENSION	89"	112"

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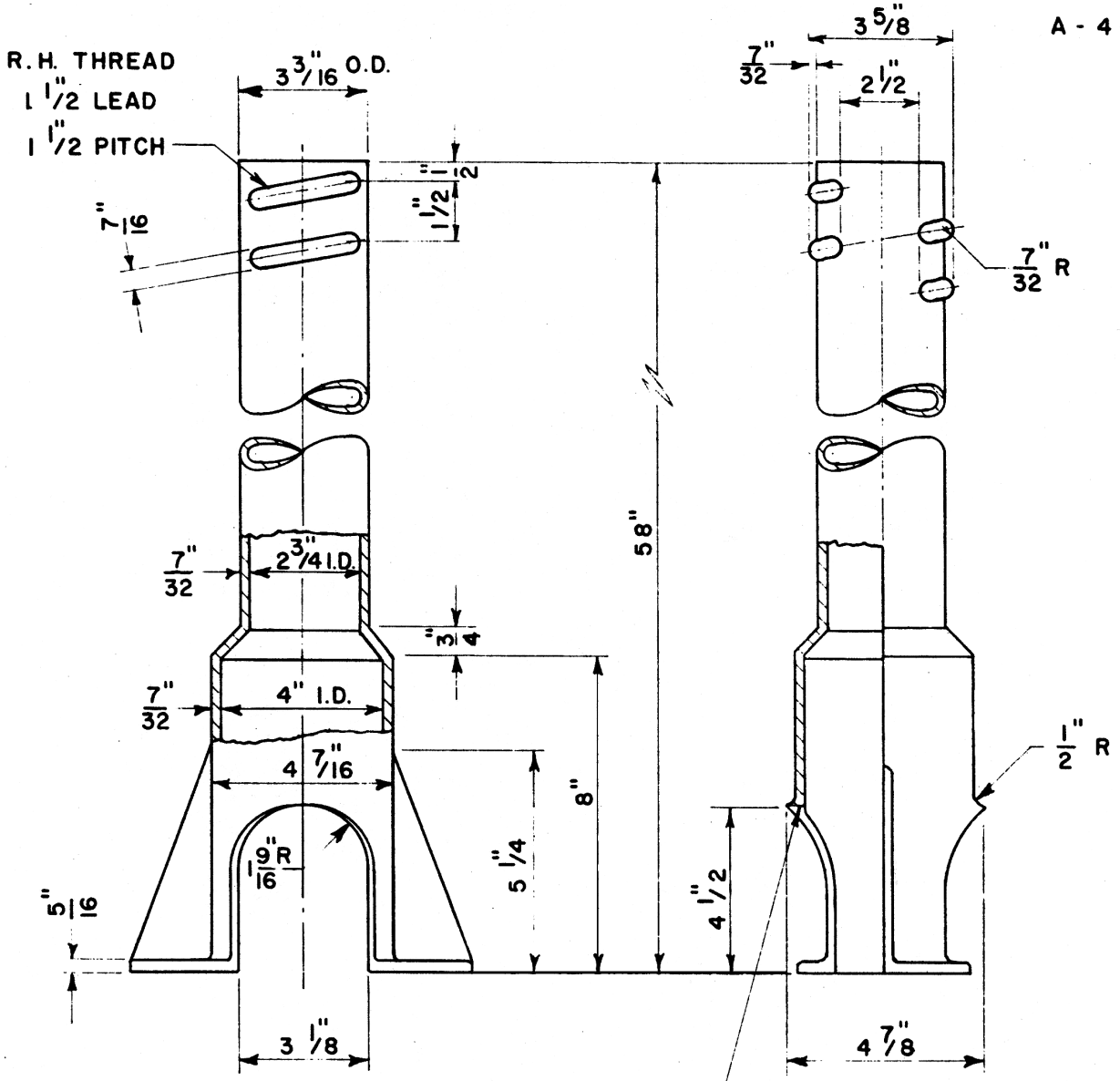
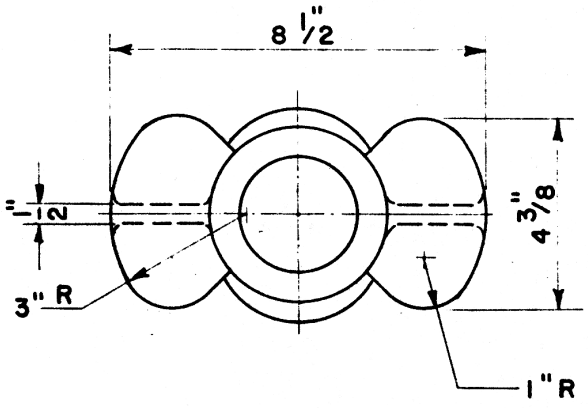
SERVICE BOX (3") ASSEMBLY

H. Hammann — ENGINEER
C. A. Schmidt — CITY ENGINEER

DRAWN N.P.L. DATE 12-15-61
CHECKED MCK SCALE 1/4" = 1"
FILE 3-5-43 DWG. SB - 11

A - 4 - 7 B





MATERIAL :-
CAST IRON - A.S.T.M. A48 CL. 20

TO BE COATED WITH ASPHALTUM PITCH VARNISH.

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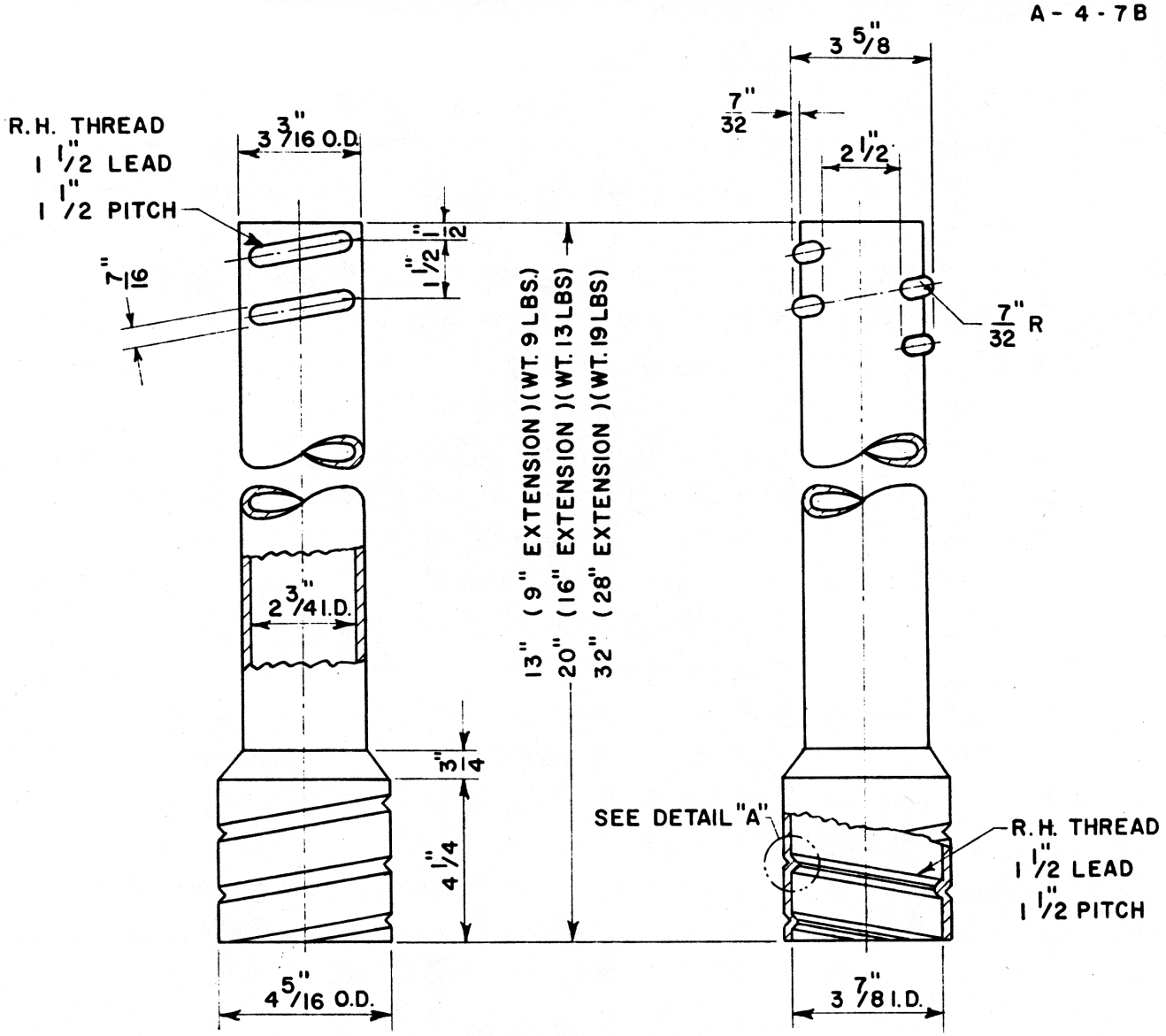
SERVICE BOX (3") BASE

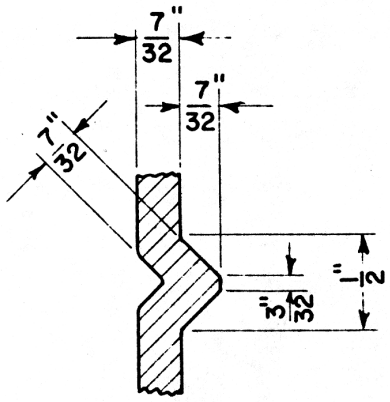
W. Hammann ENGINEER E. A. Schmidt CITY ENGINEER

DRAWN N.P.L. DATE 12-8-61
CHECKED MCK SCALE 1/4" = 1"
FILE 3-5-43 DWG SB-12

A - 4 - 7 B



EXTENSION



DETAIL "A"
SCALE FULL

NOTE :-
4" ENGAGEMENT EACH END

MATERIAL :-
CAST IRON - A.S.T.M. A 48 CL. 20
TO BE COATED WITH ASPHALTUM PITCH VARNISH.

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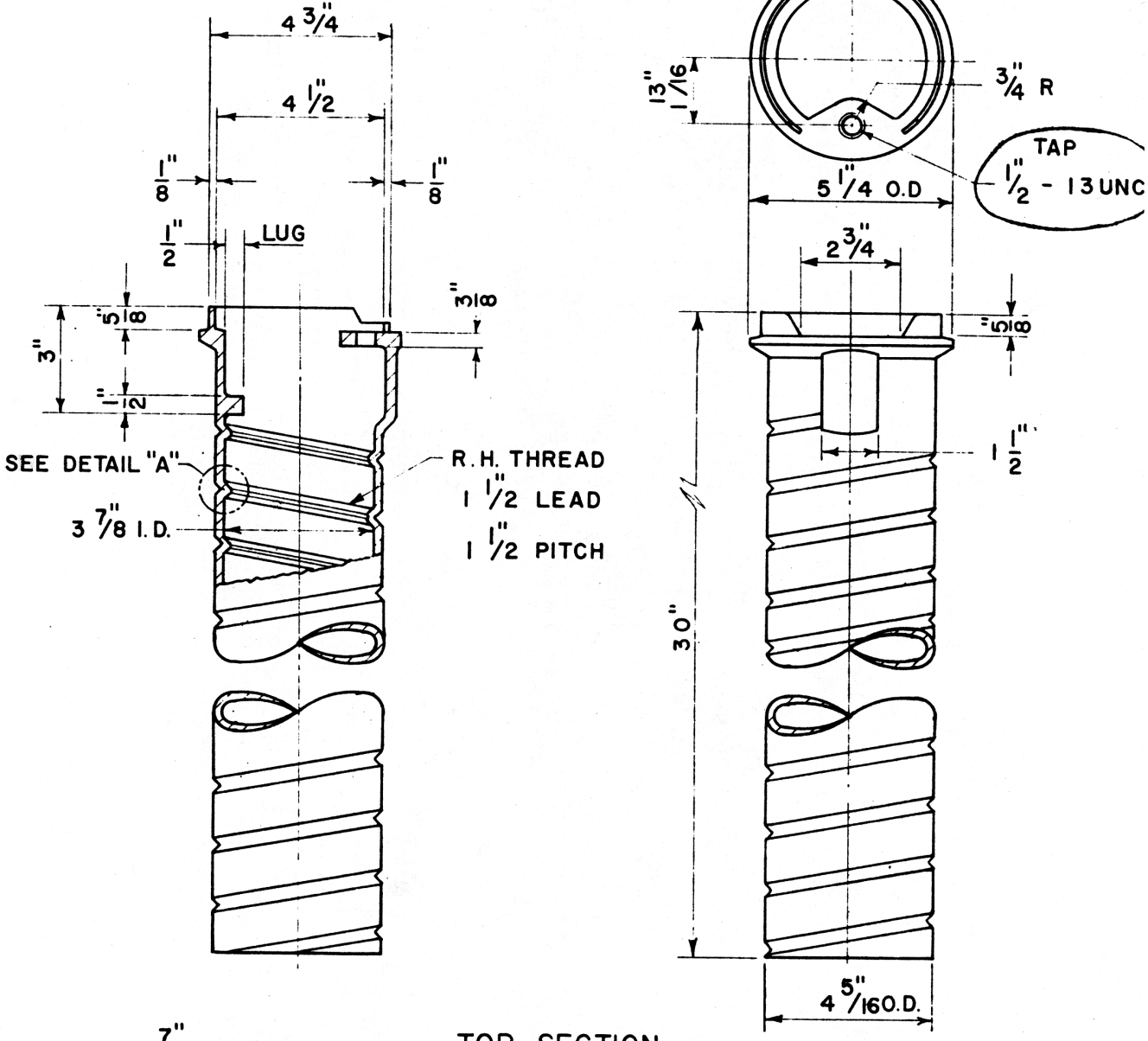
SERVICE BOX (3") EXTENSION

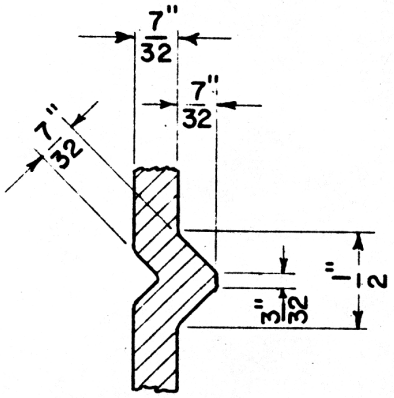
H. Hammann ENGINEER E. A. Schmidt CITY ENGINEER

DRAWN N.P.L. DATE 12-12-61
CHECKED MCK SCALE 1/4" = 1"
FILE 3-5-43 DWG. SB-13



TOP SECTION

WEIGHT 27 LBS.



DETAIL "A"

SCALE FULL

REV. 3-12-73

MATERIAL :-

CAST IRON - A.S.T.M. A 48 CL.20

TO BE COATED WITH ASPHALTUM PITCH VARNISH.

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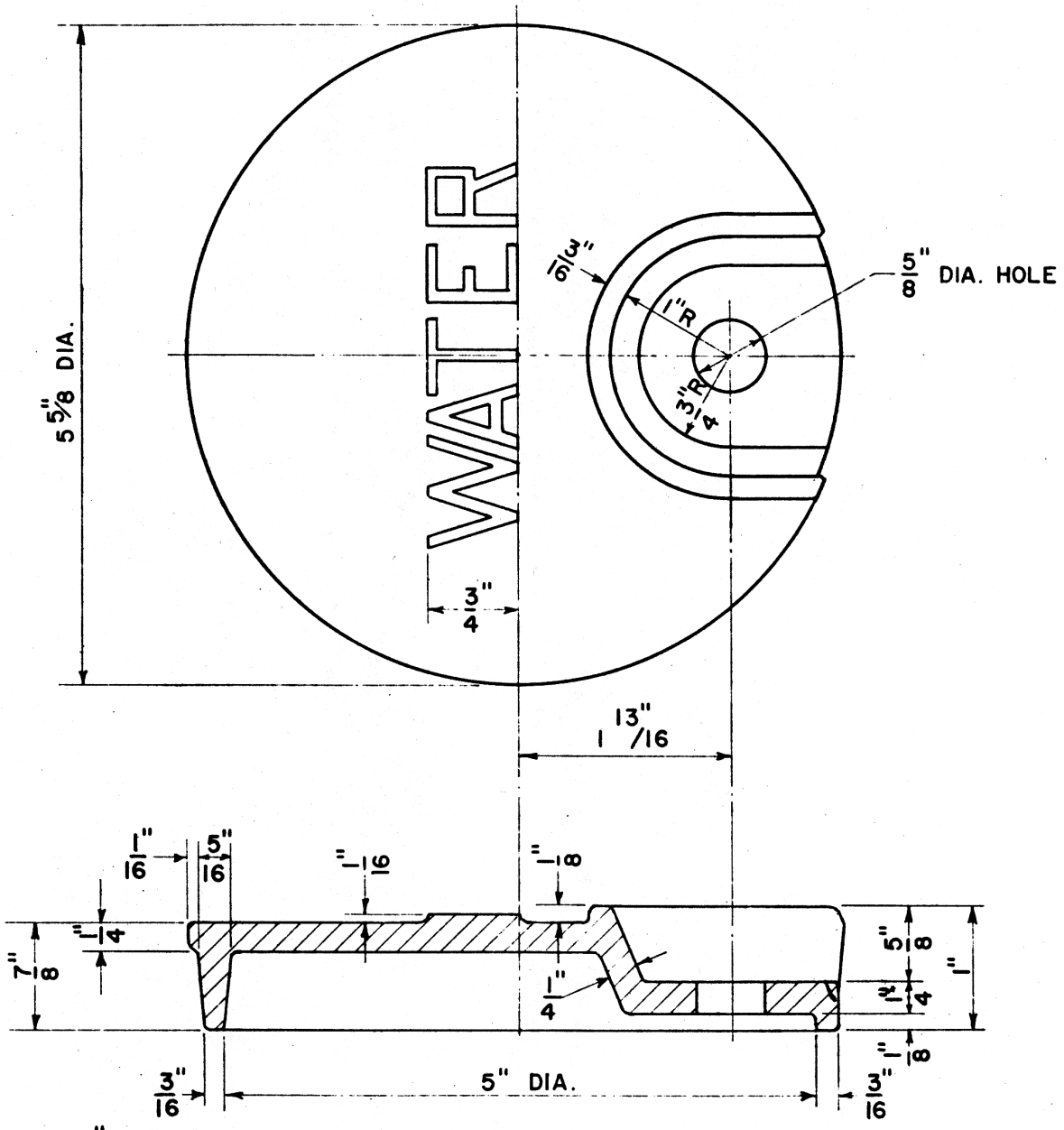
DEPARTMENT OF PUBLIC WORKS

SERVICE BOX (3")
TOP SECTION

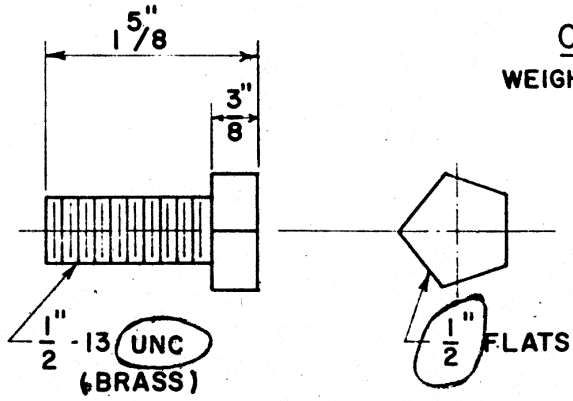
H. Hammann ENGINEER E. A. Schmidt CITY ENGINEER

DRAWN N.P.L. DATE 12-4-61
CHECKED MCK, PAH SCALE 1/4" = 1"
FILE 3-5-43 DWG SB-14



COVER

WEIGHT 2 LBS.



PENTAGON HEAD BOLT

REV. 3-12-73

MATERIAL :- (COVER)
CAST IRON - A.S.T.M. A 48 CL.2(

TO BE COATED WITH ASPHALTUM PITCH VARNISH.

WATER ENGINEERING DIVISION
BUREAU OF ENGINEERS
MILWAUKEE WATER WORKS
DEPARTMENT OF PUBLIC WORKS

SERVICE BOX (3")
COVER AND BOLT

H. Hammann E. A. Schmidt
ENGINEER CITY ENGINEE

DRAWN N.P.L. DATE 11-27-61
CHECKED MCK, PH CALE 3/4"=1"
FILE 3-5-43 DWG SB-15

APPENDIX B

SPECIFICATION FOR CAST IRON VALVE BOXES

CAST IRON (BUFFALO PATTERN)

City of Milwaukee
Specification No. 30-B-7
March 3, 1980
(Revised June 17, 1993)
(W.E.D. No. 7A-P-3/80)

I. GENERAL REQUIREMENTS

The latest version of City of Milwaukee Specification No. 70b-D-7 on file with the Department of Administration - Purchasing shall apply except as modified in the technical requirements as described herein.

II. TECHNICAL REQUIREMENTS

A. Description

Valve boxes specified herein shall be screw type and shall consist of a base, middle section, top section with cover, and intermediate extension sections. The top section shall be designed to thread onto the middle section so that the unit can be adjusted to a variable length. The top section shall be designed to receive a circular drop cover. Valve boxes may have extension sections designed to fit between the middle and top section to achieve the required length. A valve box is installed to provide access to the operator of a direct buried valve.

B. Material

The valve box and component parts shall be cast iron in accordance with ASTM-A48 class 20 or approved equal.

C. Valve Box Design

The valve box and component parts shall be the "Buffalo Pattern" in accordance with drawings VB-1 through VB-13 and shall be constructed within dimensional tolerances that shall assure interchangeability with valve boxes manufactured in accord with these drawings.

The valve box shall be a three-piece 5-1/4" diameter unit, screw type, cast iron, in accordance with the following requirements:

1. The inside diameter of the base section as shown on drawing VB-6 shall be 14" minimum.

2. Overall height of the box shall be in accordance with the table below.

Standard Box

Size Identification	Retracted Maximum	Extended Minimum
"D"	47"	65"
"DD"	53"	71"
"F"	69"	82"

3. The 27" nominal top section as shown on drawing VB-3 shall be between 25" and 29" in length.

4. One extension section may be used to achieve the "Standard" overall height the "F" middle section as shown on Drawing VB-4.

5. The height increase of the extension section as shown on drawing VB-5 shall be 14", 18", or 20".

6. Fixed risers (rings) as shown on drawings VB-7, VB-10, and VB-11 shall fit the "Buffalo Pattern" valve box and shall be the circular drop type capable of 1", 2", 2-1/2" or 3" height increase as required.

7. Adjusting riser (section) shall fit the "Buffalo Pattern" valve box, with screw type design (drawings VB-8 or VB-12) or slip type (Drawing VB-13) as required, and shall be capable of 9" minimum height increase.

8. Covers as shown on drawings VB-2 and VB-9 shall be the standard circular drop type with the word "Water" cast flush with the top of the cover. When covers are required with fixed or adjustable risers, the cover shall fit the risers specified.

D. Workmanship and Finish

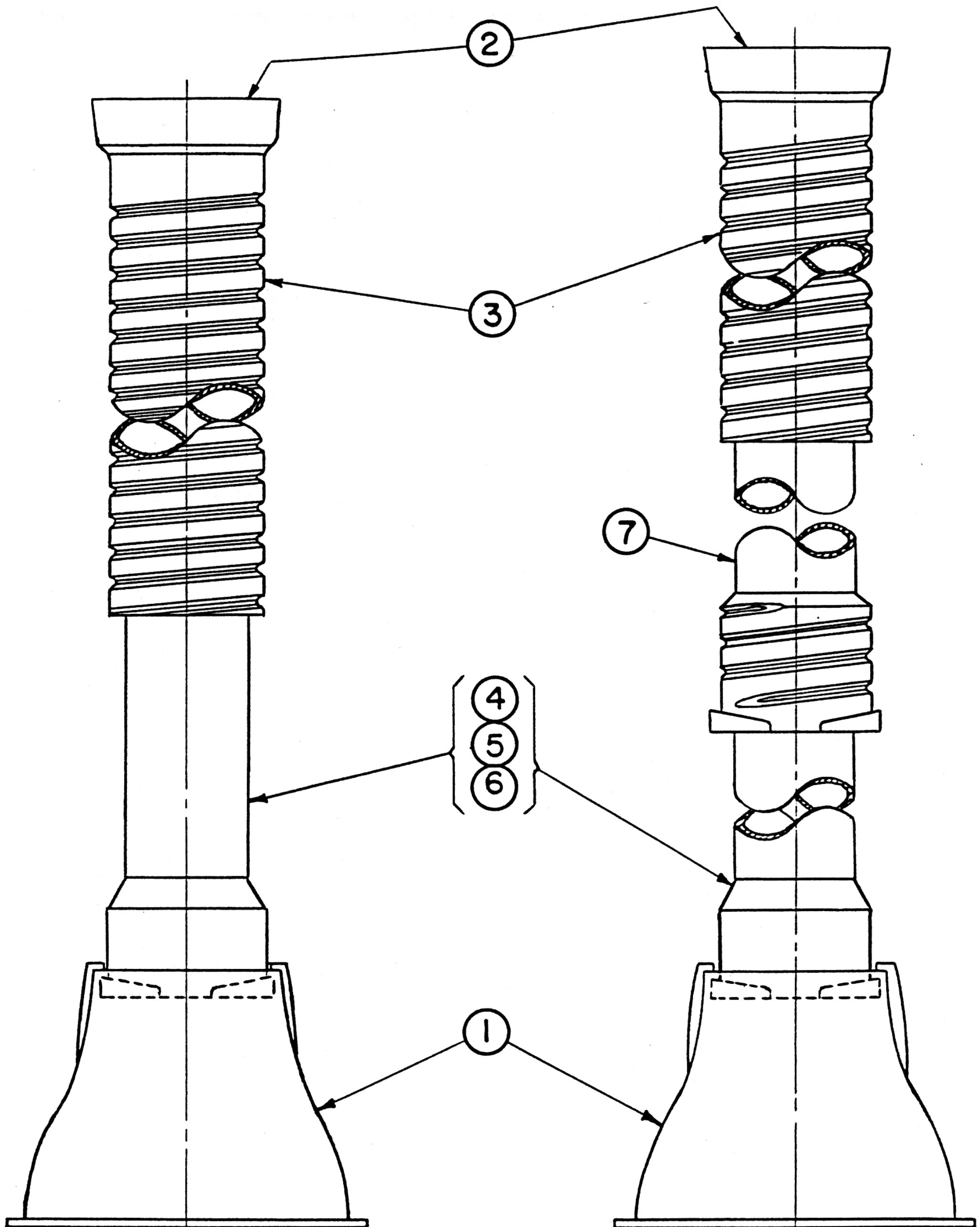
The cast iron valve box and components shall be free from blowholes, coldshots, shrinkage defects, cracks or other injurious defects and shall have a normal smooth casting finish.

E. Coating

All cast iron valve boxes and components shall be thoroughly coated with asphaltum pitch varnish or approved equal.

IV. INSPECTION

The Plumbing Inspector, or his duly authorized representative shall inspect Service Box Installations. The contractor shall provide at his own expense such facilities and assistance required to carry out the inspection. The Plumbing Inspector shall have the authority to reject any work, material and parts there of which do not comply with the requirements.



VALVE BOX

VALVE BOX WITH EXTENSION

(1) BASE
(2) COVER
(3) TOP SECTION
(4) "D" SECTION
(5) "D D" SECTION
(6) "F" SECTION
(7) EXTENSION

BOX	STANDARD	
	RETRACTED	EXTENDED
"D"	47"	65"
"D D"	53"	71"
"F"	69"	82"

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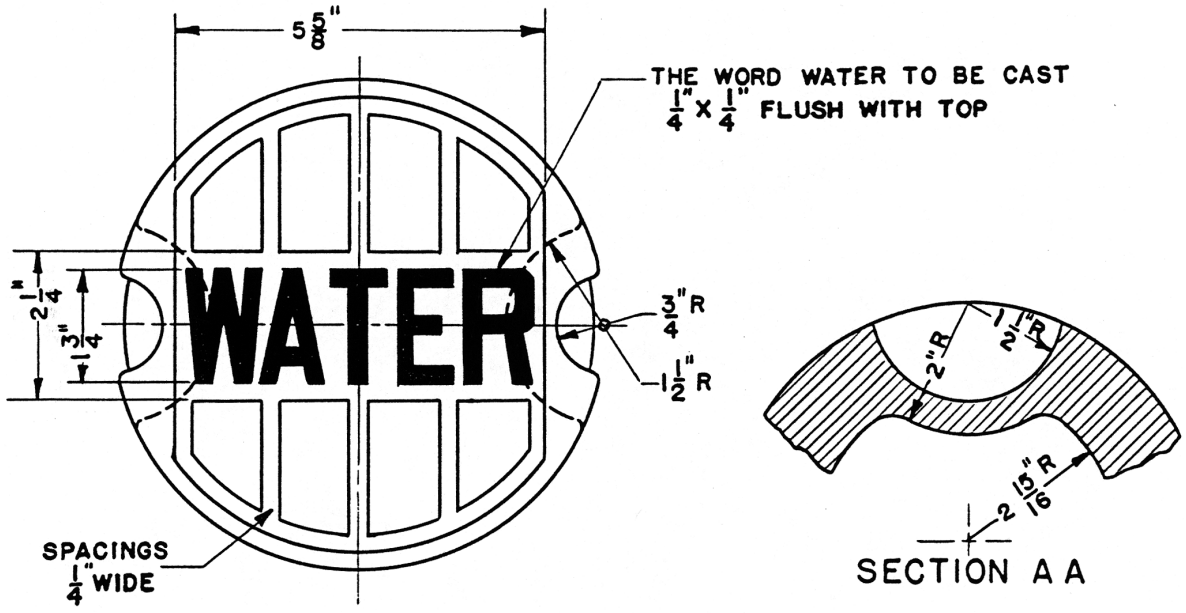
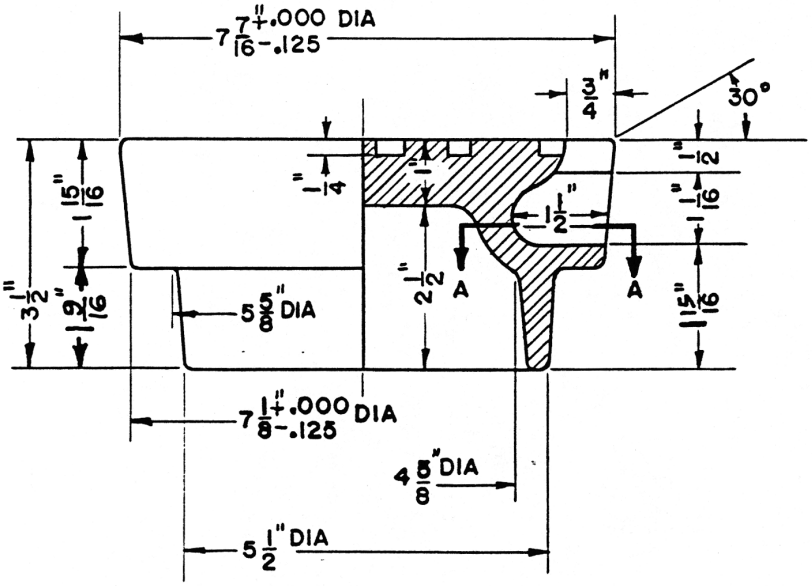
VALVE BOX
ASSEMBLY

ENGINEER — CITY ENGINEER

DRAWN J.R.S. — DATE 9-10-82
CHECKER W·E·P — SCALE 1/8"=1"
FILE A-4-7A — DWG. VB-1





MATERIAL: CAST IRON
A. S. T. M. A 48 CL 20
PAINT COATING:
TO BE THOROUGHLY COATED
WITH ASPHALTUM PITCH
VARNISH

WEIGHT – 18 LBS.

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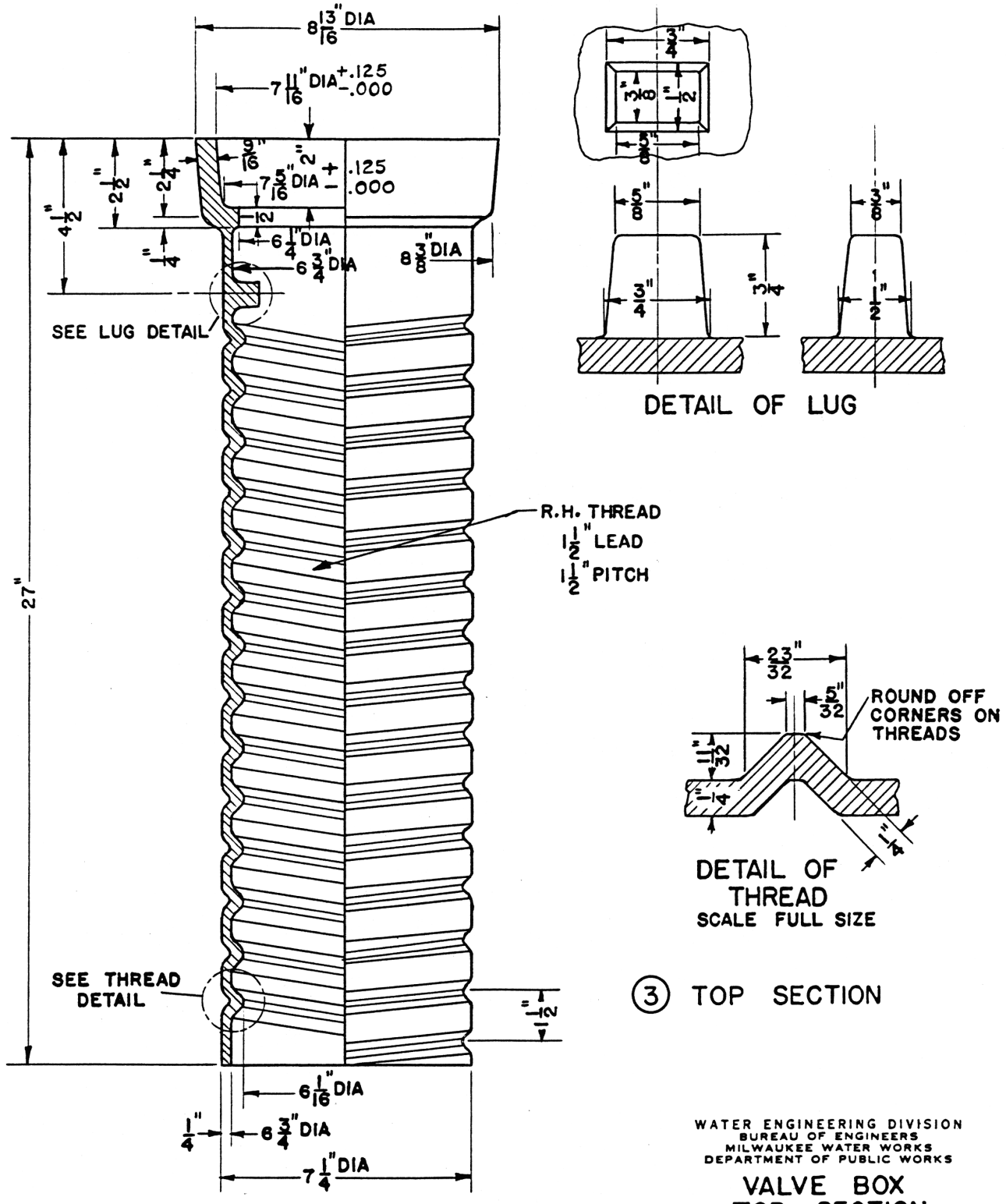
VALVE BOX (STD.) COVER

R. J. Kocol — ENGINEER
C. J. Laszewski — CITY ENGINEER

DRAWN J. R. S.
CHECKED W. E. P
FILE A-4-7A
DATE 9-10-82
SCALE 3/8"=1"
DWG VB-2

② COVER



DETAIL OF LUG

DETAIL OF THREAD
SCALE FULL SIZE

③ TOP SECTION

MATERIAL: CAST IRON
A. S. T. M. A48 CL20
PAINT COATING:
TO BE THOROUGHLY COATED WITH ASPHALTUM PITCH VARNISH

WEIGHT 53LBS.

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VALVE BOX TOP SECTION

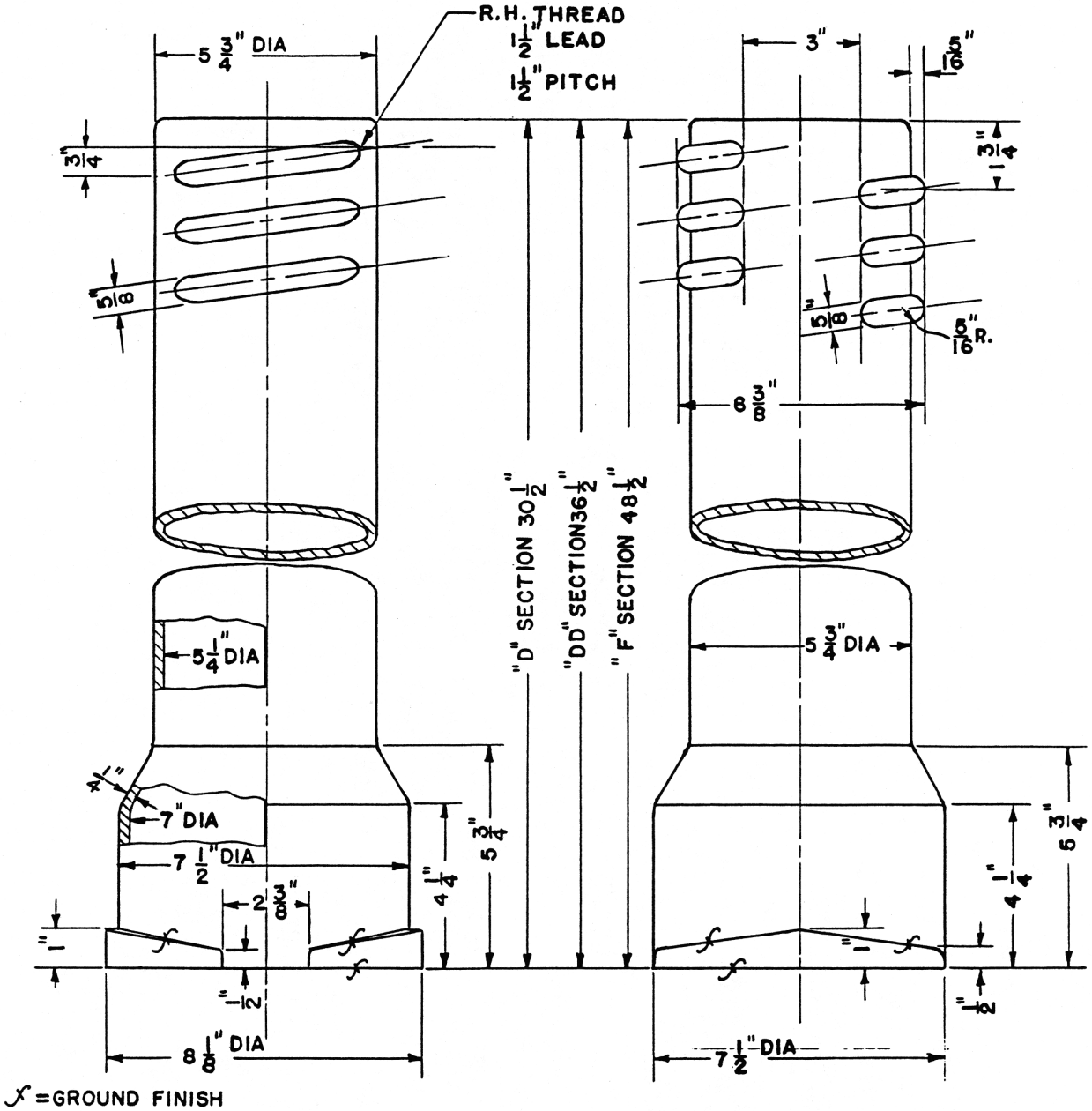
R. J. Kosel — ENGINEER
C. J. Laszewski — CITY ENGINEER

DRAWN J.R.S. DATE 9-10-82
CHECKED W.E.P. SCALE 1/4"=1"
FILE A-4-7A DWG. VB-3

MATERIAL: CAST IRON
A S T M A48 CL20

PAINT COATING:
TO BE THOROUGHLY COATED WITH ASPHALTUM PITCH VARNISH

WEIGHT
"D" SECTION 38 LBS
"DD" SECTION 43 LBS
"F" SECTION 59 LBS



④ "D" SECTION
⑤ "DD" SECTION
⑥ "F" SECTION -(May be composed of two castings As Approved)

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VALVE BOX MIDDLE SECTIONS

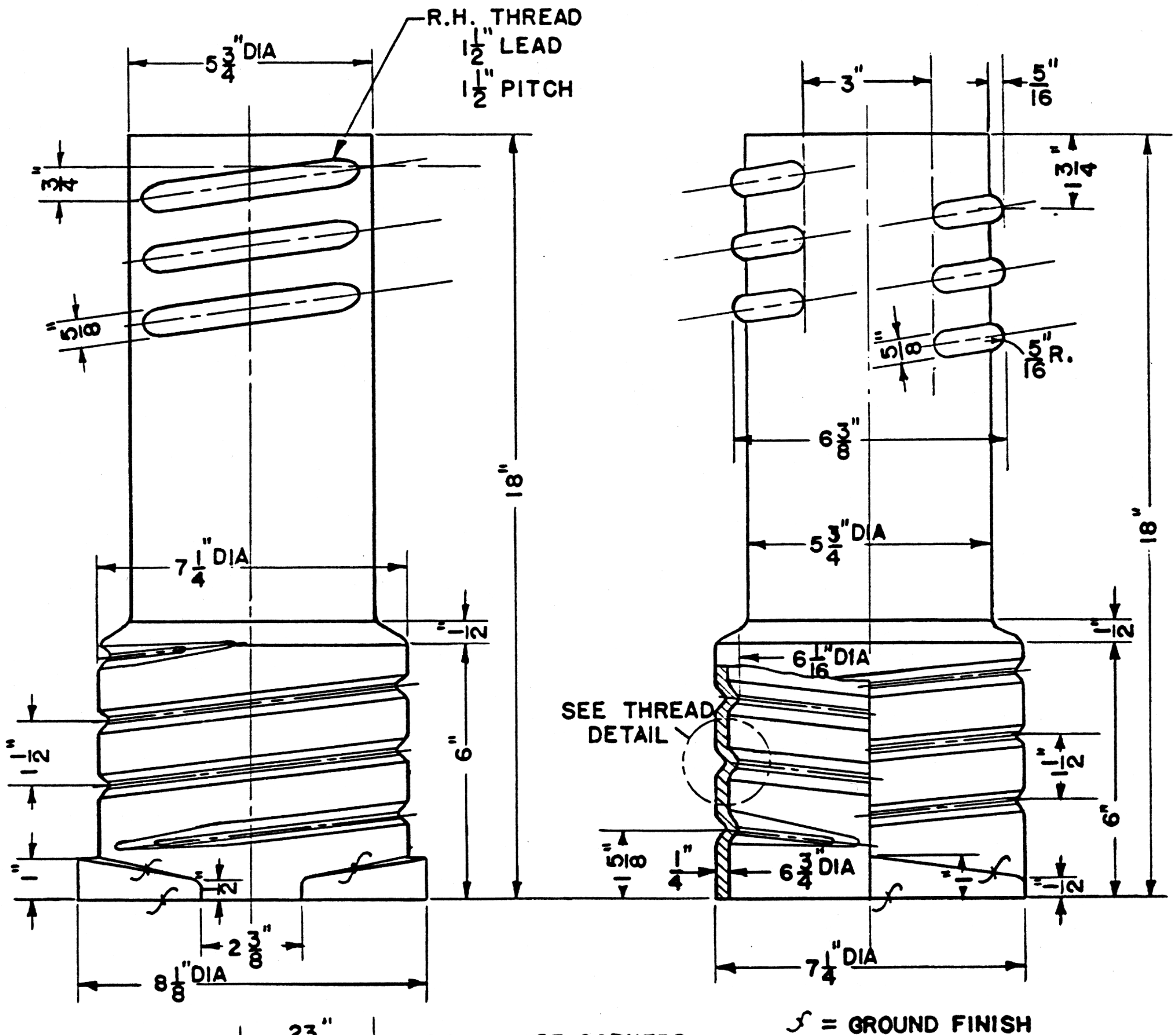
R. A. Koch — ENGINEER
E. J. Lange — CITY ENGINEER

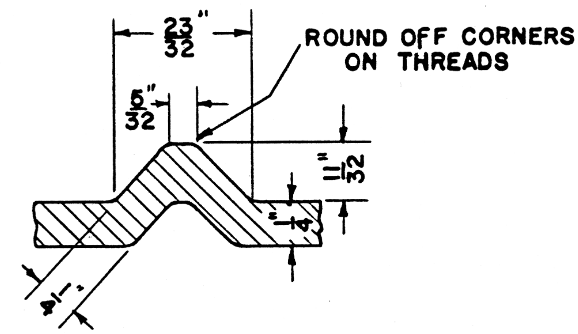
DRAWN J.R.S.
CHECKED W.E.P
FILE A-4-7A
DATE 9-10-62
SCALE 1/4=1"
DWG. VB-4

MATERIAL: CAST IRON
A.S.T.M. A 48 CL 20

PAINT COATING:
TO BE THOROUGHLY COATED
WITH ASPHALTUM PITCH
VARNISH

WEIGHT-25LBS.





DETAIL OF THREAD
SCALE FULL SIZE

(7) EXTENSION

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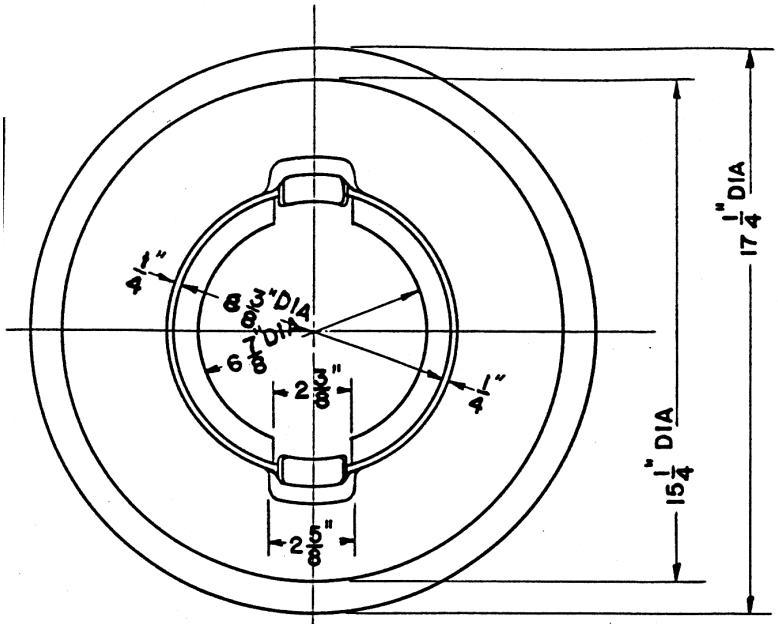
VALVE BOX
EXTENSION

R. J. Koral ENGINEER
E. J. Lozynski CITY ENGINEER

DRAWN J.R.S. DATE 9-10-82
CHECKED W·E·P SCALE 1/4=1
FILE A-4-7A DWG. VB-5

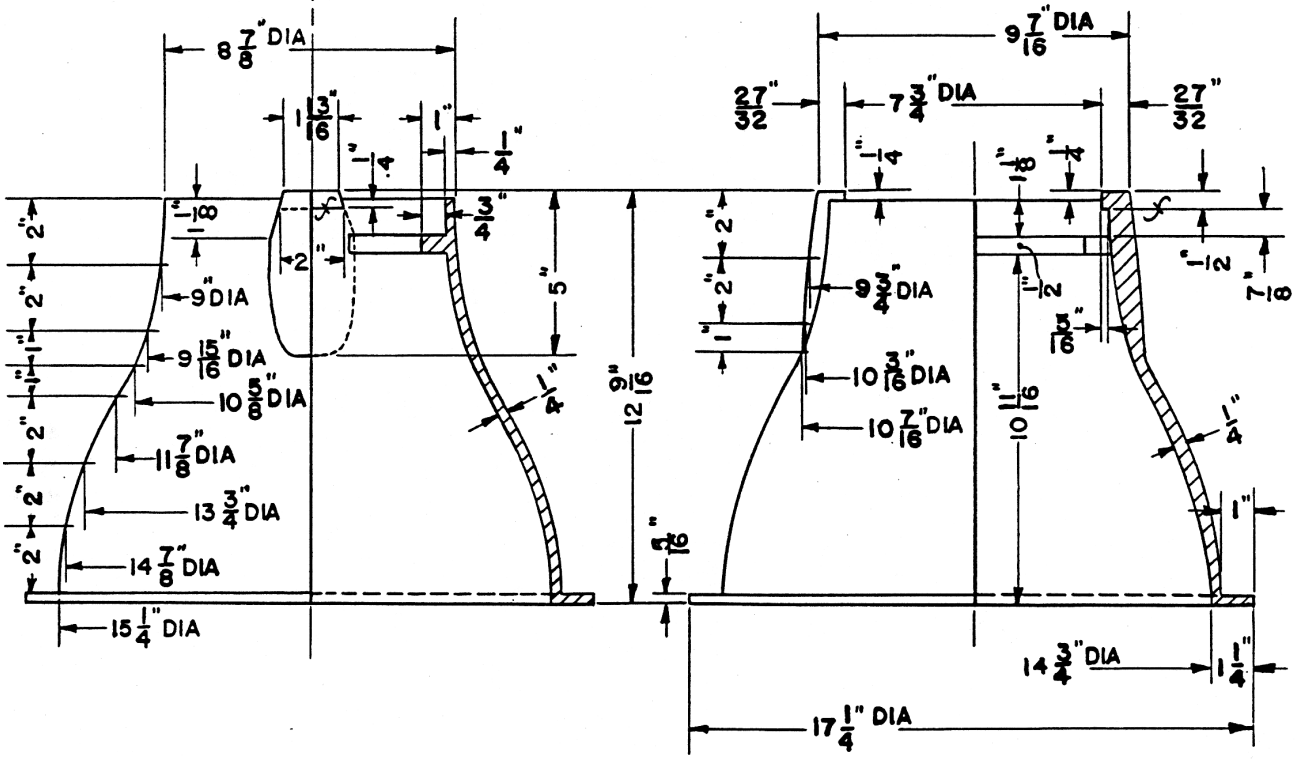


MATERIAL: CAST IRON
A.S.T.M. A48 CL 20

PAINT COATING:
TO BE THOROUGHLY COATED WITH ASPHALTUM PITCH VARNISH

WEIGHT-45LB.

$\mathcal{F}$ = GROUND FINISH



(1) BASE

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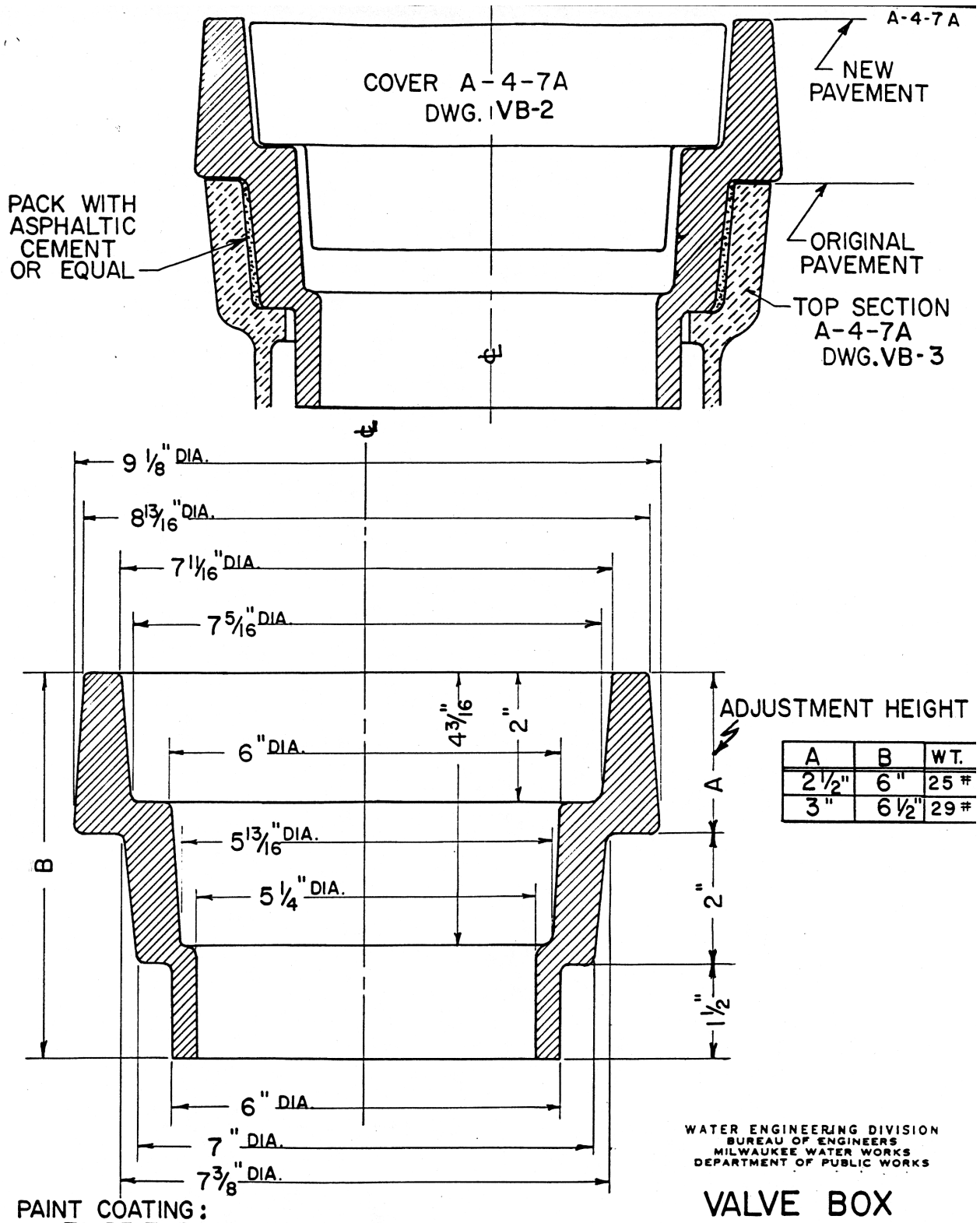
MILWAUKEE WATER WORKS
DEPARTMENT OF PUBLIC WORKS

VALVE BOX
BASE

R. A. Koral E. J. Langenhan

ENGINEER CITY ENGINEER

DRAWN J.R.S. DATE 9-10-82
CHECKED W.E.P SCALE 3/16"=1"
FILE A-4-7A DWG VB-6



A	B	WT.
2 1/2"	6"	25 #
3"	6 1/2"	29 #

PAINT COATING:
TO BE THOROUGHLY COATED WITH ASPHALTUM PITCH VARNISH

MATERIAL: CAST IRON
A.S.T.M. A48-CLASS NO. 20.

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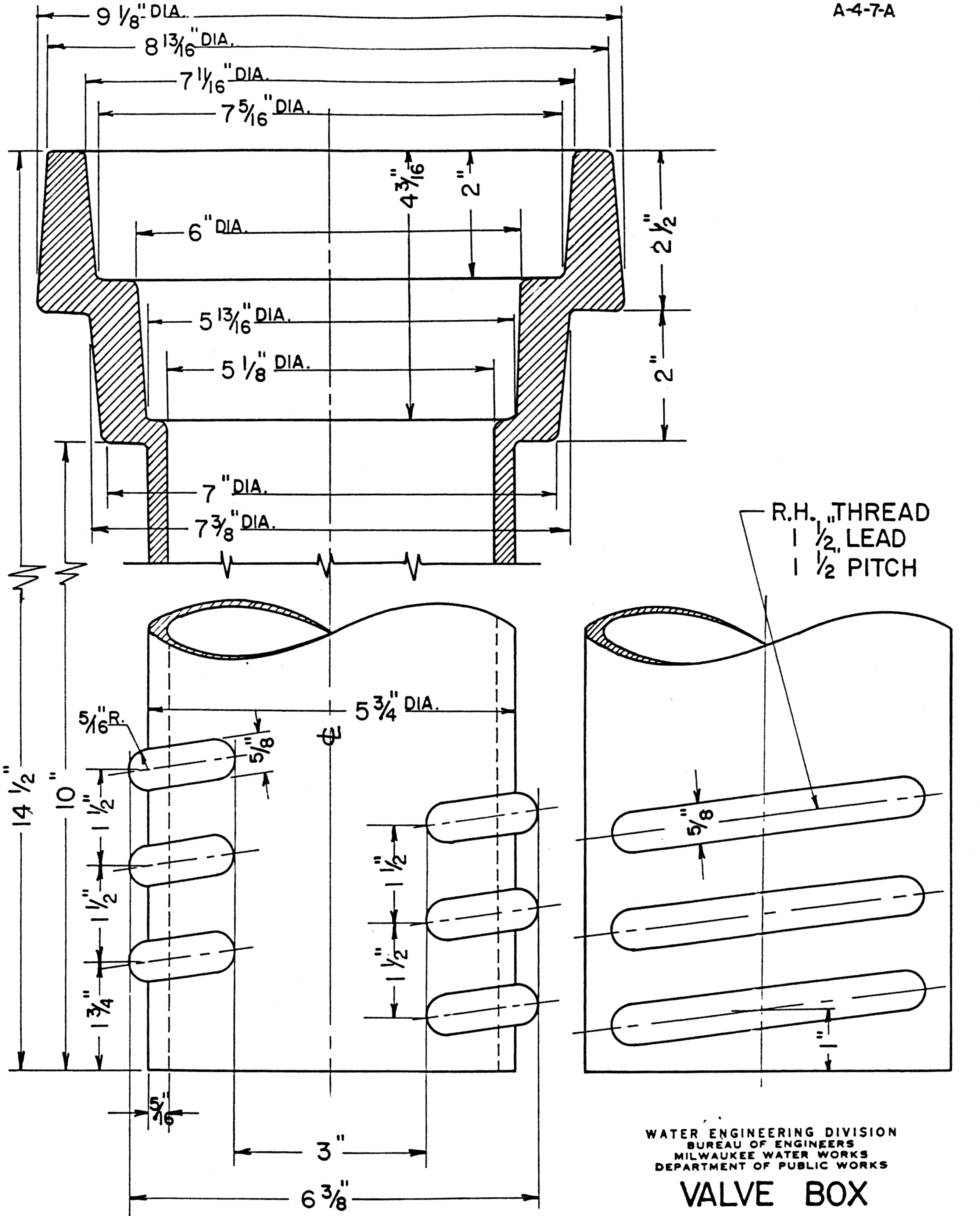
VALVE BOX ADJUSTING RING

R. J. Kocal — ENGINEER
E. J. Torzewski — CITY ENGINEER

DRAWN H.B.-J.S. DATE 9-10-82
CHECKED W.E.P SCALE N.T.S.
FILE A-4-7A DWG VB-7

A-4-7-A



PAINT COATING:
TO BE THOROUGHLY COATED WITH ASPHALTUM PITCH VARNISH

MATERIAL: CAST IRON
A.S.T.M. A48—CLASS NO. 20.

WEIGHT - 40 LBS.

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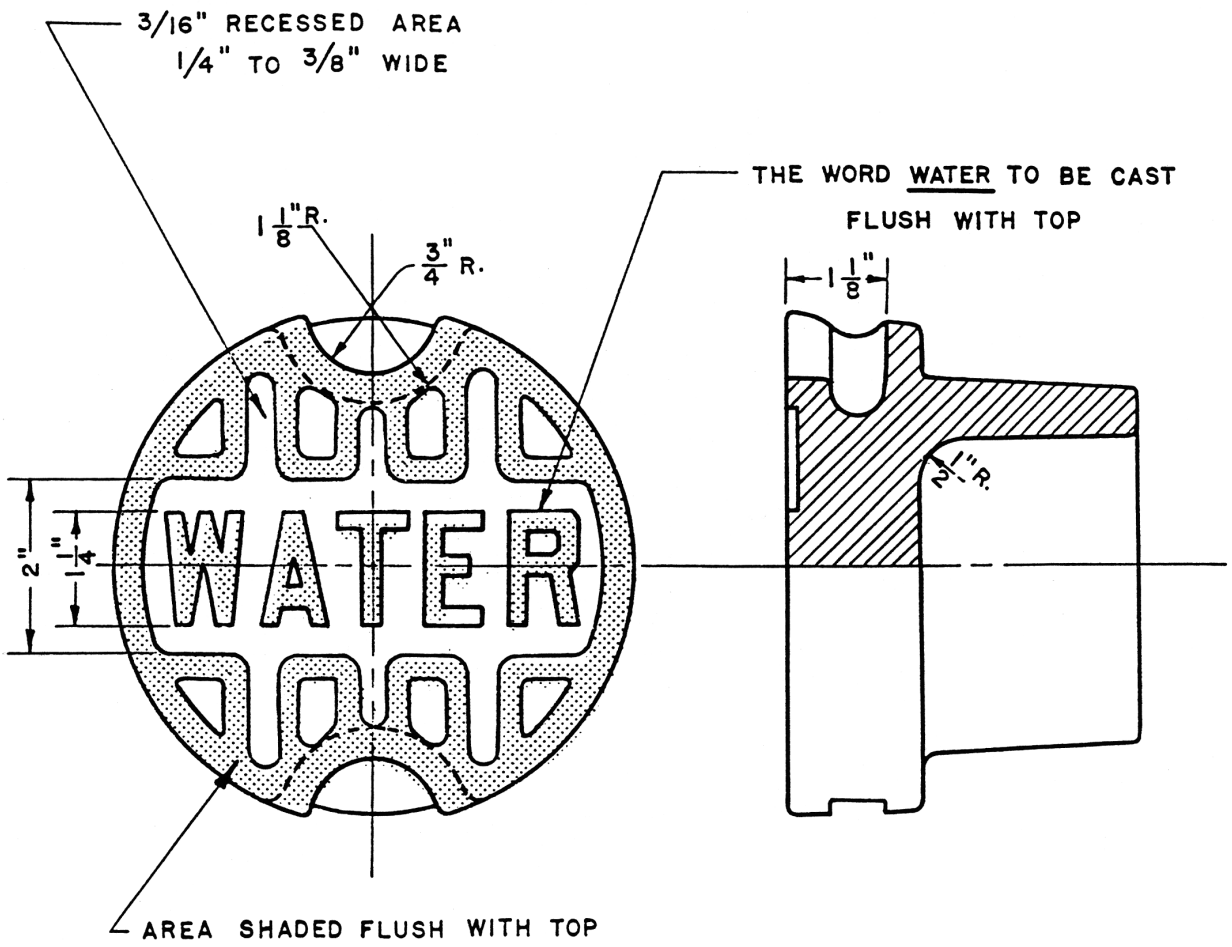
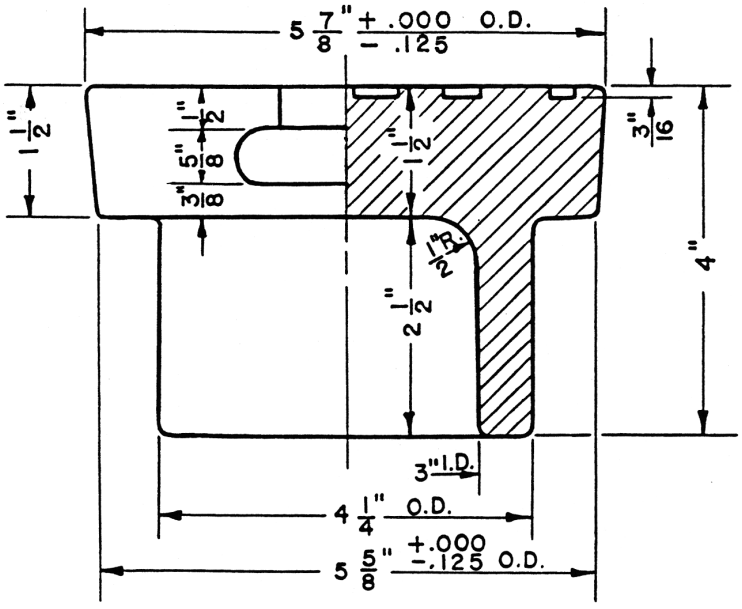
VALVE BOX
ADJUSTING·TOP·SECTION

ENGINEER — CITY ENGINEER

DRAWN H.B.—J.S. DATE 9-10-82
CHECKED W·E·P SCALE N.T.S.
FILE A-4-7A DWG. VB-8





MATERIAL: CAST IRON
A.S.T.M. A48 CLASS-20
PAINT COATING:
TO BE THOROUGHLY COATED WITH ASPHALTUM PITCH VARNISH

WEIGHT - 13 LBS.

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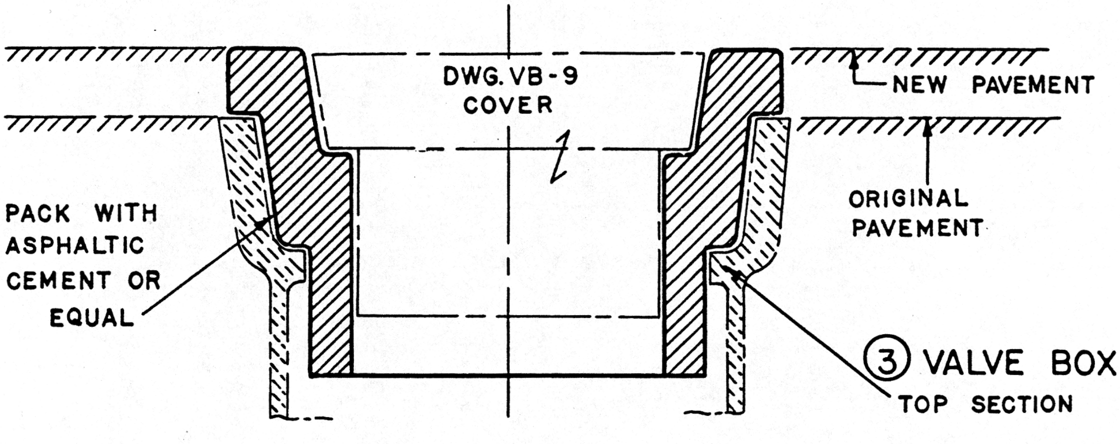
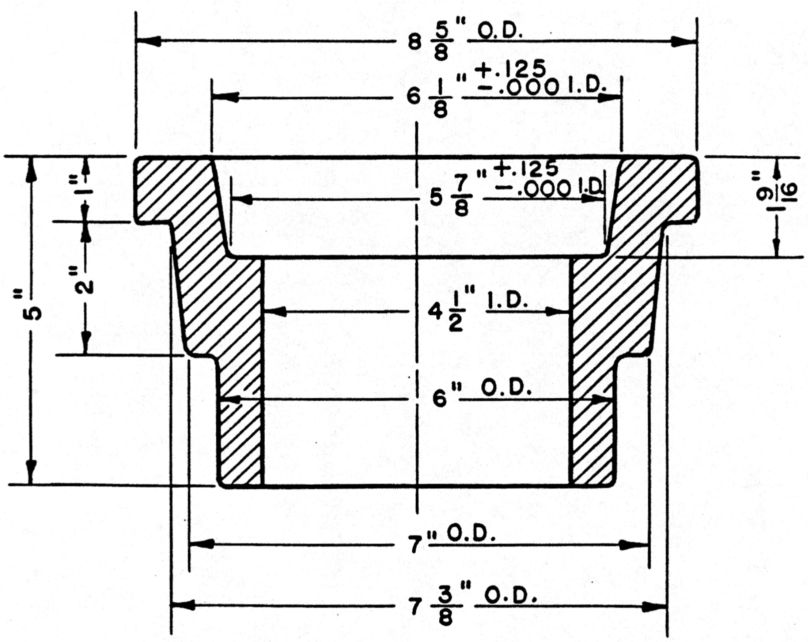
VALVE BOX (SM.) COVER

R. A. Koval — ENGINEER
E. J. Langenhan — CITY ENGINEER

DRAWN W. M.
CHECKED W·E·P
FILE A-4-7A
DATE 9-10-82
SCALE 1/2 = 1"
DWG. V-B-9



TYPICAL INSTALLATION



MATERIAL: CAST IRON
A.S.T.M. A 48 CLASS-20

PAINT COATING:
TO BE THOROUGHLY COATED
WITH ASPHALTUM PITCH
VARNISH

WEIGHT 25 1/2 LBS.

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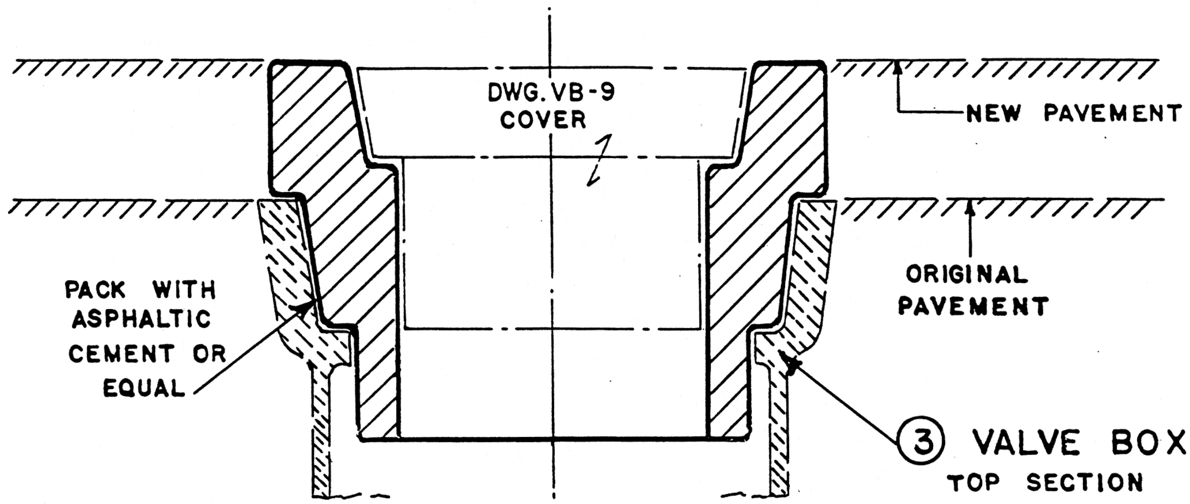
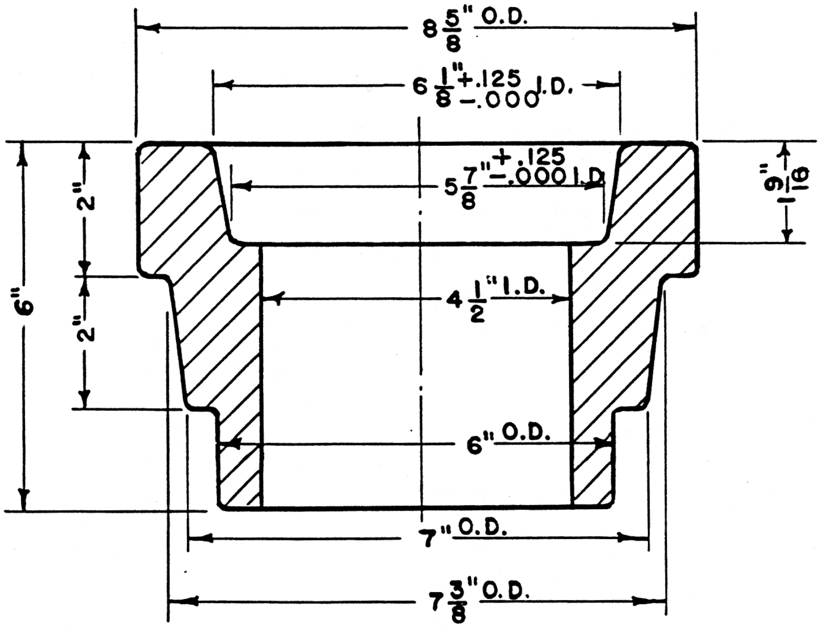
VALVE BOX
ADJUSTING RING

ENGINEER CITY ENGINEER

DRAWN W.M. DATE 9-10-82
CHECKED W.E.P SCALE 3/8" = 1"
FILE A-4-7A DWG. VB-10



TYPICAL INSTALLATION



MATERIAL: CAST IRON
A.S.T.M. A48 CLASS-20

PAINT COATING:
TO BE THOROUGHLY COATED
WITH ASPHALTUM PITCH
VARNISH

WEIGHT 35 LBS.

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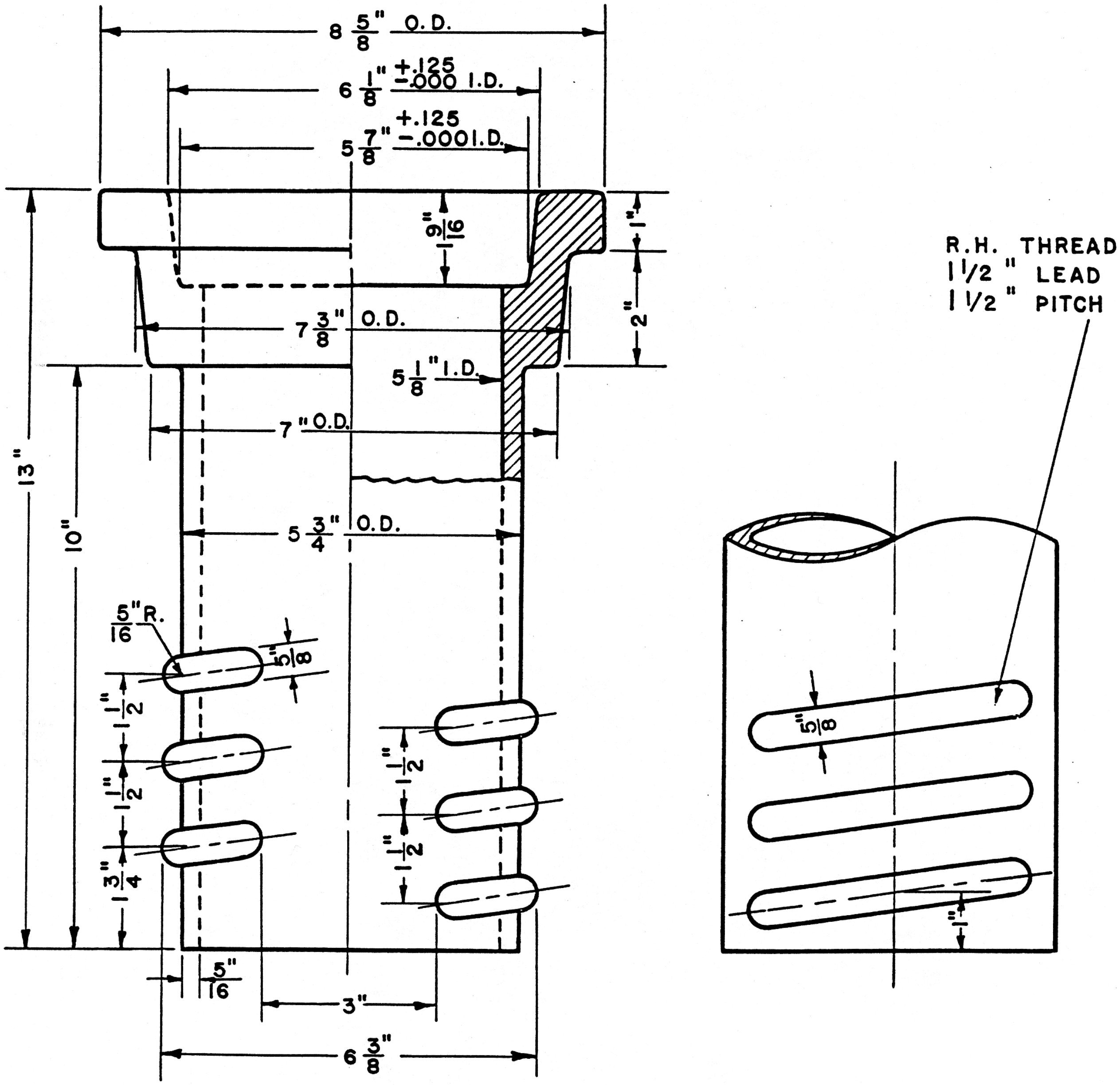
VALVE BOX
ADJUSTING RING

ENGINEER
CITY ENGINEER

DRAWN M.C.K.
CHECKED W.E.P
FILE A-4-7A

DATE 9-10-82
SCALE 3/8" = 1"
DWG. VB-11



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MATERIAL: CAST IRON
A.S.T.M. A48 CLASS-20

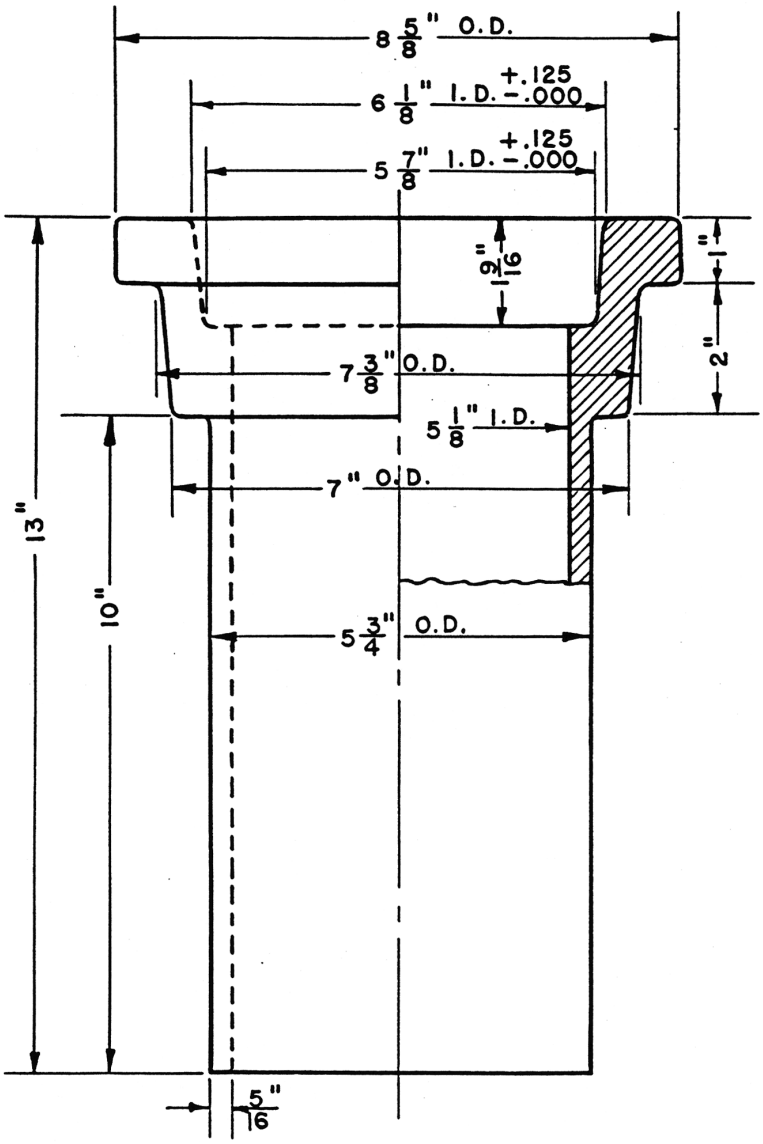
PAINT COATING:
TO BE THOROUGHLY COATED WITH ASPHALTUM PITCH VARNISH

WEIGHT 28LBS.

VALVE BOX
ADJUSTING TOP SECTION

ENGINEER | CITY ENGINEER

DRAWN W. M. | DATE 9-10-82
CHECKED W·E·P | SCALE 3/8" = 1"
FILE A-4-7A | DWG VB-12



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MATERIAL: CAST IRON
A.S.T.M. A48 CLASS-20

PAINT COATING:
TO BE THOROUGHLY COATED
WITH ASPHALTUM PITCH
VARNISH

WEIGHT 30 LBS.

VALVE BOX
ADJUSTING TOP SECTION

R.J. Koel — ENGINEER
E.J. Jaszewski — CITY ENGINEER

DRAWN W. M
CHECKED W.E.P
FILE A-4-7A
DATE 9-10-82
SCALE 3/8" = 1"
DWG. VB-13

APPENDIX C

SPECIFICATIONS FOR IRON BODY GATE VALVES 3" to 12"

I. GENERAL REQUIREMENTS

Valves under this specification shall conform to MSS SP-70 and AWWA C500/93 except as modified in the technical requirements as described herein.

II. TECHNICAL REQUIREMENTS

A. Description

Valves shall be Type III as defined in MSS SP-70 and shall have a rating of 200 psig, WOG, non-shock and be Class 125. They shall be of an outside screw and yoke (OS&Y) double disc design with parallel seats.

B. Material

Body and Bonnet shall be gray iron in accordance with ASTM A 126 Class B or ductile iron in accordance with ASTM A 536 or ASTM A 395.

C. Design

1. End Connections shall be flanged and bolted joint as detailed in ANSI/AWWA C110/A21.10 or ANSI B16.1 class 125.

2. Threads. The threads of the stem and stem nut (disk bushing) shall be ACME, modified ACME, or one-half V-type.

3. Hand-wheel shall have not less than three spokes. Webbed or disk hand-wheels are not acceptable. Hand-wheel shall be clearly marked showing the opening direction.

4. Valves shall open by turning the hand-wheel to the left (counter-clock wise).

5. Stuffing Boxes and Packing. Length of the packing in contact with the stem shall be at least equivalent to one diameter of the stem passing through the packing.

D. Testing

Each valve shall be tested in accordance with MSS SP-70.

E. Workmanship

Valve parts shall be designed and manufacturing tolerances set so as to provide interchangeability in the product of any one manufacturer between units of the same size, class, type, and design, except the individual fit of the disc in the body. All castings shall be sound and clean without defects that shall impair their service. No plugging, impregnation, welding or repairing of such defects shall be allowed.

III. INSPECTION AND CERTIFICATION

Upon demand, the manufacturer shall furnish in triplicate a report that shall certify the duration and pressure of all hydrostatic tests, the physical properties and chemical analyses of the metal used for the stem, body, bonnet and disc, also the assembled weight of each valve. Materials that do not meet all specification requirements shall be rejected.

APPENDIX D

SPECIFICATIONS FOR BRONZE GATE VALVES
¾" to 2"

I. GENERAL REQUIREMENTS

Valves under this specification shall conform to MSS SP-80 for bronze gate valves as modified herein. Valves shall be installed in building piping and water meter installations and shall meet current code requirements in full.

II TECHNICAL REQUIREMENTS

A. Description
Valves shall have a rating of 125 psig and be class A. They shall be a Type I or Type II solid wedge disc gate valve design.

B. Material
Valve body shall be cast bronze, conforming to ASTM B62-C83600 or ASTM B61-C92200.

C. Design
1. End Connections shall be:
   a. Female I.P. pipe threads made in accordance to ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).
   b. Solder joint ends shall be prepared in accordance with applicable requirements of ANSI B16.18.

2. Hand-wheel shall have at least three spokes, and shall have a minimum diameter in accordance to MSS SP-80.

3. Valves shall open by turning the hand-wheel to the left (counter-clockwise).

4. The seats and wedge disc guides shall be integral with the body casting. The guides shall be arranged so as to support the wedge disc in all travel positions.

5. The valve disc shall be single-wedge construction and shall have machined seating surfaces and shall be securely attached to the stem in all operating positions.

D. Testing
Each valve shall be tested in accordance with MSS SP-80.

E. Workmanship

Valve parts shall be designed and manufacturing tolerances set so as to provide interchangeability in the product of any one manufacturer between units of the same size, class, type, and design, except the individual fit of the disc in the body. All castings shall be sound and clean without defects that shall impair their service. No plugging, impregnation, welding or repairing of such defects shall be allowed.

III. INSPECTION AND CERTIFICATION

Upon demand, the manufacturer shall furnish a report that shall certify the duration and pressure of all hydrostatic tests, the physical properties and chemical analyses of the metal used for the stem, body, bonnet and disc, also the assembled weight of each valve. Materials that do not meet all specification requirements shall be rejected.

APPENDIX E

SPECIFICATIONS FOR BRONZE BALL VALVES
¾" to 3"

I. GENERAL REQUIREMENTS

Valves under this specification shall conform to MSS SP-110 except as modified in the technical requirements as described below.

II. TECHNICAL REQUIREMENTS

A. Description

Valves shall have a rating of 150 psig, WOG, non-shock and be Class 125. They shall be of a full port design and shall be two or three piece design.

B. Material

Body and end piece(s) shall be cast bronze in accordance with ASTM B-584. Body bolts, were applicable, shall be of a material specified in ASME B16.34 Table 1, Group 4. The ball shall be of a material in accordance with ASTM B-584 or ASTM B-16 with chrome plate for two-piece valves and ASTM B-16 Alloy C36000 with chrome plate or 316SS for three-piece valves.

C. Design

1. The valve shall be of full port design in accordance with MSS SP-110.

2. End Connections shall be:
   a. Female I.P. pipe threads made in accordance to ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).
   b. Solder joint ends shall be prepared in accordance with applicable requirements of ANSI B16.18.

3. Valves shall open by turning the handle to the left (counter-clockwise). If the handle is the sole means of indication of ball port position, it shall be design such that the handle cannot be assembled to indicate other then the true position of the ball port.

D. Testing

Each valve shall be tested in accordance with MSS SP-110.

E. Workmanship

Valve parts shall be designed and manufacturing tolerances set so as to provide interchangeability in the product of any one manufacturer between units of the same size, class, type, and design, except the individual fit of the disc in the body. All castings shall be sound and clean without defects that shall impair their service. No plugging, impregnation, welding or repairing of such defects shall be allowed.

III. INSPECTION AND CERTIFICATION

Upon demand, the manufacturer shall furnish a report that shall certify the duration and pressure of all hydrostatic tests, the physical properties and chemical analyses of the metal used for the stem, body, bonnet and disc, also the assembled weight of each valve. Materials that do not meet all specification requirements shall be rejected.

APPENDIX F

REQUIREMENTS FOR METER SETTING PIPE

Pipe Size

1	Standard Weight Brass Pipe
1¼"	Standard Weight Brass Pipe
1½"	Standard Weight Brass Pipe
2"	Standard Weight Brass Pipe
3"	Galvanized .216 Wall
4"	Galvanized .237 Wall or Class 55 Ductile Iron Flanged
6"	Galvanized .280 Wall or Class 55 Ductile Iron Flanged
8"	Galvanized .326 Wall or Class 55 Ductile Iron Flanged
10"	Galvanized .365 Wall or Class 55 Ductile Iron Flanged
12"	Galvanized .406 Wall or Class 55 Ductile Iron Flanged

Brass pipe shall be standard weight or heavier conforming to ASTM B43-98.

Steel pipe shall be schedule 40 galvanized conforming to ASTM A53/A53M-99b.

Class 55 Ductile Iron Flanged shall conform to ANSI/AWWA C151/A21.51-91 and ANSI/AWWA C115/A21.15-99.

APPENDIX G

METER HORN SPECIFICATIONS

I. GENERAL REQUIREMENTS

Meter horns under this specification shall conform to the technical requirements as described below. This specification applies to 5/8", 5/8" x ¾", ¾" and 1" meter horns.

II. TECHNICAL REQUIREMENTS

A. Description
Meter horns are installed to facilitate the installation of the water meter.

B. Material
Meter horns shall be fabricated of type "K" soft temper copper tubing and solid 85-5-5-5 alloy castings.

Meter coupling nuts shall be provided with 1/8" thick flat leather or U.S. "Paramo" or equal washer having I.D. equal to meter size and O.D. to fit snug inside of meter coupling threads.

C. Design

1. The end of the copper tube at the meter coupling nut shall be spun or upset to produce a substantial flange. The flange shall bear on the full face of the gasket.

2. Bends in the copper tubing shall be smooth full diameter bends.

3. Each meter horn shall bear the manufacturer's name or trade mark.

4. Connection to piping shall be:
   a. Male or female pipe threaded tail- pieces fastened with union nuts.
   b. Solder joint ends shall be prepared in accordance with applicable requirements of ANSI B16.18.

III. INSPECTION AND CERTIFICATION

Upon demand, the manufacturer shall furnish a report that shall certify the physical properties and chemical analyses of the metal used for the tubing, connector pieces and washers. Materials that do not meet all specification requirements shall be rejected.

APPENDIX H

PIPE REPAIR CLAMPS
ALL STAINLESS STEEL
Sizes 2" through 16"

I. GENERAL REQUIREMENTS

All stainless steel pipe repair clamps may be used to repair breaks in cast iron branch piping.

II. TECHNICAL REQUIREMENTS

A. Description

Pipe repair clamps as described herein shall consist of a rubber liner completely enclosed and fastened in a stainless steel assembly all of which is galvanically passive to gray cast or ductile iron.

B. Materials

Repair clamp materials shall conform to the following requirements:

1. All metallic components shall be made of 300 series AISI Austenitic 18-8 stainless steel.

2. Bands and bridging for pipe sizes 2" thru 12" shall be 20 gauge minimum and for pipe sizes 16" shall be 18 gauge minimum.

3. The gaskets shall be made of 100% new compounds of Neoprene rubber or approved equal, suitable for use on a potable water main.

4. The studs shall be welded to the stiffeners and the lugs welded to the band with austenitic 18-8 stainless steel rod. All welds shall have corrosion resistance equal to or greater than 18-8 stainless steel.

5. Armor shall be 14 gauge minimum and molded into gasket to prevent "hanging up" during installation.

6. The tapped outlet, when required to be furnished on the repair clamp, shall be permanently fused to the repair clamp body by means of Heliarc welding and fully passivated. The clamp shall be chemically cleaned after welding to maintain the original passive state of the stainless steel.

C. Repair Clamp Design

Repair clamps shall be designed in accordance with the following requirements:

1. The bands shall be constructed of a single section for sizes 2" thru 12" and two sections for 16" size

2. Repair clamp shall be fastened by means of bolts or studs welded to the side stiffeners.

3. Repair clamps shall fit the pipes with outside diameters as shown below.

Pipe Size	Minimum	Maximum
2"	2.38	2.62
3"	3.75	4.00
4"	4.80	5.00
6"	6.90	7.10
8"	9.05	9.30
10"	11.10	11.40
12"	13.20	13.50
16"	17.40	17.80

4. Joint lugs shall be furnished with a maximum bolt spacing of 4". The lugs shall be adequately secured to the body and shall be designed to prevent bending of the bolts.

5. The nuts and bolts shall have UNC Class 2 fit and shall be a minimum of 1/2" diameter for the 2" thru 4" size, and a minimum of 5/8" diameter for the 6" thru 16" sizes, and shall be 18-8 stainless steel.

6. The gaskets shall be molded to a nominal thickness of 3/16" and shall be resistant to crystallizing, aging and permanent set.

D. Hydraulic Capability

All components of the pipe repair clamps in each size shall be adequate in size to withstand a minimum of 150 psi when sealing a pipe opening of 6 square inches.

E. Marking

The range of pipe O.D.'s are to be marked on the outside band surface.

F. Certifications

Upon request, the contractor shall submit the manufacturer's certifications in duplicate to the Superintendent of Milwaukee Water Works, certifying the materials and physical properties of the materials used in producing the pipe.

APPENDIX I

SPECIFICATIONS FOR FITTINGS, GRAY IRON OR DUCTILE IRON FLANGE OR RUBBER GASKET JOINTS Sizes 3" through 16"

I. GENERAL REQUIREMENTS

Fittings under this specification shall conform to AWWA C110, C111, and C115 except as modified in the technical requirements as described below.

II. TECHNICAL REQUIREMENTS

A) Description

Fittings provided under this specification shall consist of coated foundry castings, in gray iron or ductile iron unless otherwise noted, fashioned and equipped with accessories in such manner as to be readily installed with gray iron or ductile iron water pipe. Fittings shall be designed with an effective internal radius at all changes in flow direction.

B) Standards

Fittings and materials furnished shall be in compliance with the American Water Works Association Standards C110/A21.10-98, C111/A21.11-00, and C115/A21.15-99 except as modified or supplemented herein.

C) Pressure Class

Fittings shall have a minimum pressure rating of 250 psi for gray iron, 350 psi for ductile iron, or as otherwise noted.

D) Joint Type

Fittings shall have joint as follows:

1. Rubber Gasket Joints

a. Push-on Joints

i. Rubber gaskets shall be furnished for each bell.
ii. Sufficient lubricant shall be furnished for all joints.
iii. When requested by the City, drawings shall be furnished as noted in Sec. 11-9.1 of AWWA C111/A21.11-00.

b. Mechanical Joints

i. Plain rubber gaskets and "full body" glands meeting the specified AWWA standard shall be furnished for each mechanical joint.

ii. A complete set of bolts and nuts shall be furnished for each mechanical joint fitting in sizes 20" through 48" diameter in accordance with Section II.G of this specification. Mechanical joint bolts and nuts for fittings in sizes 3" through 16" diameter are not required.

iii. Bolt holes shall be oriented in the standard configuration which straddle the vertical centerline, determined when the fitting is in the position to change the direction of the flow in a horizontal plane, in accordance AWWA C110/A21.10-98.

2. Flange Joints:

a. Full faced rubber or fibre gaskets shall be furnished for each flange joint.

b. A complete set of bolts and nuts for each flange joint shall be furnished in accordance with AWWA C115/A21.15-99. Bolts shall be 300 Series 18-8 Stainless Steel conforming to ASTM A276 or ASTM A193 and shall meet the following minimum values:

Tensile Strength 75,000 psi
Yield Strength 30,000 psi
Elongation 30%

The nuts shall be extra heavy design 300 Series 18-8 Stainless Steel material, the same type as the bolts. See section J.2 of this specification for certification requirements.

E) Laying Length

The laying length of push-on and lead joint fittings shall be approximately equal to that of mechanical joint fittings as listed in the tables of AWWA C110-A21.10-98.

F) Special Fittings

All required fittings that are not listed in AWWA C110/A21.10-98 shall conform to thickness requirements of AWWA C110/A21.10-98 for Class 250, and to all applicable requirements of AWWA standards. Mechanical joint bolts and nuts shall be furnished in accordance with section D of this specification.

1. Anchoring tees shall be supplied with mechanical joint ends on the run and collared plain end (PE) on the branch to fit the bell of mechanical joint fittings. A rotating gland shall be furnished for the

plain end. The bolts and nuts holding the two split halves of the rotating gland shall be furnished in accordance with section II.G of this specification.

2. Anchoring couplings and bends shall be supplied with collared plain ends (PE) to fit the bell of mechanical joint fittings, and shall have an integral follower gland and one rotating gland. The bolts and nuts holding the two split halves of the rotating gland shall be furnished in accordance with section G of this specification.

3. Dual-size sleeves for distribution mains shall be supplied with mechanical joint ends. The sleeve shall be capable of sliding over the Class C-D pipe to connect Class 55 ductile iron pipe to Class C-D pit cast pipe in accordance with the following sizes:

Nominal Size	Class 55 D.I. Pipe Nominal O.D.	Class C-D Pit Cast Pipe Maximum O.D.
3"	3.96"	4.06"
4"	4.80"	5.10"
6"	6.90"	7.20"
8"	9.05"	9.40"
10"	11.10"	11.50"
12"	13.20"	13.60"
16"	17.40"	17.90"

a. The dual-size sleeve may be a standard mechanical joint sleeve machined to the proper oversize diameter, however, the thickness of the sleeve wall and the toe of the gland must meet minimum thickness requirements.

b. Mechanical joint bolts and nuts are not required.

c. A segmented gland and/or a split gasket may be substituted for the one piece gland and gasket on the oversize end of the dual-size sleeve.

d. All sleeves and their glands shall be clearly marked to indicate that they are dual-size.

G) Bolts and Nuts

Except as modified or supplemented herein, all bolts and nuts furnished on mechanical joint and special fittings shall be made of one of the following materials:

1. High-strength, low-alloy, corrosion-resistant steel conforming to AWWA C110/A21.10-98

2. 300 Series 18-8 Stainless Steel, or

3. Low-zinc bronze.

H) Coatings
Interior and exterior coatings shall conform to AWWA C110/A21.10-98.

I) Markings
The markings shall conform to Sec. 10.11 of AWWA C110/A21.10-98.

J) Certifications and Manufacturing Data
Upon request, the manufacturer shall submit the appropriate certifications in duplicate to the City Engineer of the City of Milwaukee for the following:

1. All fittings furnished in accordance with AWWA C110/A21.10-98.

2. Each size bolt and nut furnished. Certification shall list as appropriate the nickel and chromium contents, yield and tensile strengths, and elongation of the sample taken and tested at the plant. Data shall also be furnished which shows the load capacity of each size bolt and nut.

3. All gaskets furnished.

K) Foundry Records
Upon request, the manufacturer shall submit the results of the specified test in duplicate to the City Engineer for all fittings furnished in accordance with AWWA C110/A21.10-98.

III. INSPECTION BY CITY

Any materials found not conforming to this specification shall be rejected and shall be replaced.

APPENDIX J

PIPE, DUCTILE IRON, CENTRIFUGALLY CAST (USING PUSH-ON RUBBER GASKET JOINTS) Sizes 3" through 16"

I. GENERAL REQUIREMENTS

Pipe under this specification shall conform to AWWA C151/A21.51-96 except as modified in the technical requirements as described below.

II. TECHNICAL REQUIREMENTS

A. Description

Ductile iron pipe described herein shall consist of pipe centrifugal cast in metal or sand-lined molds, each having a bell designed for a push-on joint, a standard cement lining and both internal and external bituminous seal coats. The iron shall be a cast ferrous material in which a major part of the carbon content occurs as free carbon in nodular or spheroid form.

B. Standards

Pipe and components furnished hereunder shall conform to the latest revisions of the following standards of the American Water Works Association, except as modified or supplemented herein:

1. Pipe - AWWA C151/A21.51-96
2. Mortar Lining - AWWA C104/A21.4-95
3. Rubber Gaskets and Lubricant - AWWA C111/A21.11-00

C. Design Features

1. Pipe dimensions shall be as follows:
   a. Laying length - 18 or 20 feet nominal
   b. Thickness - In accordance with the following table:

Size Inches	Thickness Class	Thickness Inches
3	53 or 55	.31 or .37
4	55	.38
6	55	.40
8	55	.42
10	55	.44
12	55	.46
16	55	.49

2. Jointing materials - A gasket shall be furnished for each bell. Sufficient joint lubricant shall be furnished for each joint.

3. Mortar Lining - Standard thickness in accordance with AWWA C104/A21.4-95 with bituminous seal coat.

4. Homogeneous Section - Pipe wall shall be homogeneous from inside to outside and shall be completely free of laminations, blisters, or other imperfections. Defects may be removed at the factory only.

5. Physical properties shall conform to the requirements of AWWA C151/A21.51-96.

D. Coating

Standard in accord with AWWA C151/A21.51-96.

E. Marking of Pipe

1. The following data shall be cast or stamped on pipe:
   a. Manufacturer's mark
   b. Year in which the pipe was produced
   c. The letter "D.I." or the word, "Ductile"

2. The following data shall be indelibly factory marked on or near the bell:
   a. Weight of the pipe before cement lining and coatings
   b. Thickness class or thickness
   c. Date and period in which the pipe was cast

3. Improper, illegible, or incomplete markings shall be cause for rejection of the pipe.

F. Certification by Manufacturer

Upon request, contractor shall submit manufacturer's certification data representing each pipe length furnished. The certification report shall clearly identify the pipe furnished.

1. Casting - Provide certification of the foundry acceptance tests and low-temperature impact tests for each casting period in which a supplied pipe was cast.

2. Hydrostatic test - Provide certification that all pipe have satisfactorily met the hydrostatic test requirements.

II. INSPECTION BY CITY

Any material found not conforming to this specification shall be rejected.

APPENDIX K

SPECIFICATION FOR DOUBLE DETECTOR CHECK VALVE ASSEMBLIES

I. GENERAL REQUIREMENTS

Double Detector Check Valve Assemblies under this specification shall conform to ASSE 1048 and be UL listed.

APPENDIX L

INSTALLATION AND REPAIR OF POLYETHYLENE FILM ENVELOPE ON WATER MAINS, SERVICES, FITTINGS AND VALVES

I. GENERAL REQUIREMENTS

Polyethylene film envelopes under this specification shall conform to AWWA C105-A21.5-99 except as modified in the technical requirements as described below.

II. TECHNICAL REQUIREMENTS

A. Description

The polyethylene film envelope (two layers) shall be installed on all water service taps from the water main to a distance of six feet and on all water service branches from the water main to the building or pit.

B. Material

The polyethylene film shall be manufactured and tested in accordance with AWWA C105/A21.5-99 and:

1. The polyethylene film shall be Class C (black).

2. The polyethylene film envelope shall be free of gels, streaks, pinholes, particles of foreign matter and undispersed raw materials. There shall be no other visible defects such as holes, tears, blisters or thinning out at folds.

3. The tape shall be a thermoplastic material with a pressure sensitive adhesive face.

C. Installation

Water mains and branch services installed since November 25, 1970, have been installed with a loose cover of polyethylene film envelope for corrosion protection. Although not intended to be completely air and water tight, the film is to provide a continuous barrier between the water pipe and the corrosion-inducing soil and salts.

All mechanical joint fittings shall be enclosed in a double layer of polyethylene film. The inside layer shall be in intimate contact with the pipe barrel, shall be tucked under the bolt heads and nuts and shall extend beyond the ends of the bolts by not less than 12 inches.

Installation must provide a one-foot overlap at each joint in the film envelope. The overlapping area is to be secured with adhesive tape.

This protection is now being extended to all copper services including corporation stops. The copper services are to be encased for a distance of six feet along the service pipe from the face of the main.

D. Repair

Small amounts of water trapped between the polyethylene envelope and the pipe are permissible; but all dirt or foreign matter shall be removed from the pipe surface and the space between, before repairs are initiated.

Minor tears or punctures in the film cover can be repaired by placing the torn parts together, cleaning and drying them, and sealing the tear or puncture with the adhesive backed tape.

The polyethylene should not be stretched to bring the torn parts together but should be relatively loose after the repair is made.

Larger tears shall be repaired by bringing the torn material together without stretching. A polyethylene patch shall be placed over the entire damaged area allowing a lap of four to six inches with the sound material along the perimeter. The patch shall be carefully taped in place so the back-filling operation shall not disturb it. The tape shall be placed on dry materials only. The patch shall extend over the top of the pipe so that the edge shall shed, rather than trap, water and dirt.

Back fill shall be carefully placed around the area of the film envelope so that this cover is not damaged. Any damage is to be repaired at once.

In laying water main, the contractor is responsible for installation of the film envelope which is subject to approval by the inspector.

In the installation of new services, repairs to the existing film and the required installation of new film along the service piping is the responsibility of the contractor and shall be made by him after the main is tapped.

All other breaks and tears in the film envelope in connection with any work being performed shall be carefully repaired by the party responsible for the damage.

In all cases, inspection of film envelope is required before back-filling takes place.

E. Storage

Sunlight and heat deteriorate polyethylene. Therefore, polyethylene film and the tape shall be stored in a clean, dry place protected from excessive heat and the sun's rays when not being used. Any polyethylene film or tape which has been damaged, or has deteriorated shall not be used.

III. ALTERNATE PROTECTIVE COVERING

"Armaflex," an elastomer product manufactured by the Armstrong Cork Company is an approved substitute for polyethylene film in protecting water services.

When applied to a minimum of 1/8 inch in thickness, it provides a dielectric property equal to 8 mil polyethylene film.

Any damaged areas must be repaired with the same degree of care that applies to polyethylene film installation. Repairs to be made with polyethylene tape, Armaflex tape or other approved means to maintain the continuous dielectric strength of the material.

IV. INSPECTION BY CITY

Any material found not conforming to this specification shall be rejected.

APPENDIX M

THRUST RESTRAINT MATERIAL

I. GENERAL REQUIREMENTS

Thrust restraint is required to prevent pullout of joints in pipe, fittings, and valves due to an unbalance of forces. Unbalanced forces exist at tees, valves, reducers, and at horizontal and vertical changes in direction.

II. TECHNICAL REQUIREMENTS

A. Description

Thrust restraint shall be installed as required. See drawings M-1 thru M-5.

B. Materials

1. Concrete buttresses

Buttresses and anchors shall consist of City of Milwaukee Class "A" concrete with a cement content of 7 bags per cubic yard. After placing, the concrete shall be covered and wetted to prevent checking until the backfill is placed.

2. Steel tie rods and strapping

a. Steel materials shall conform to ASTM A-575, any grade from M1012 through M1025 or an approved equal.

b. Bolts and nuts shall conform to ASTM A-307. Nuts shall be heavy grade. Structural shapes shall conform to ASTM-A-36.

3. All steel pipe restraint material shall be protected by one of the following methods:

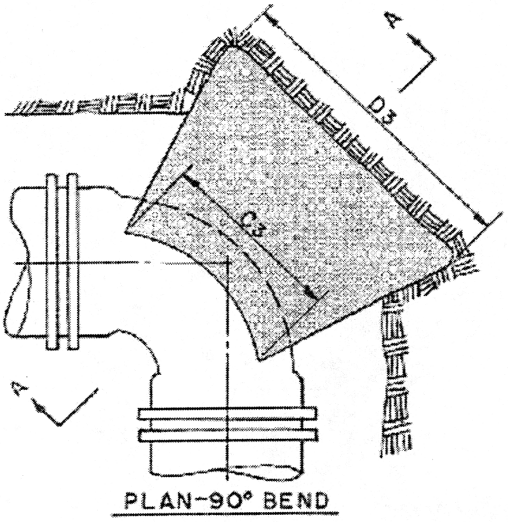
a. Coating - All materials shall be carefully cleaned and dried. The materials shall be inspected to assure they are clean and dry prior to the application of the coating. After the surfaces have been adequately prepared all surfaces including crevices shall be coated with a heavy coating of Koppers Bitumastic 50 or 505.

b. Encasement in a polyethylene film envelope. Sufficient number of layers shall be installed in intimate contact in such a manner that the polyethylene shall not be punctured when the backfill materials are placed. In no case shall the number of layers be less than two. Polyethylene shall conform to the requirements of Appendix L.

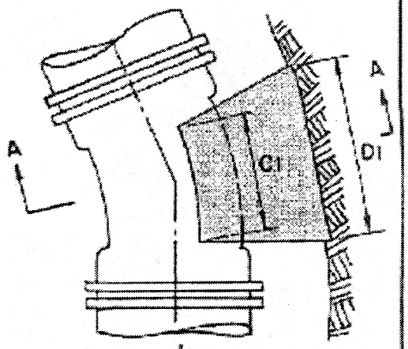
III. INSPECTION AND CERTIFICATION

Materials that do not meet all specification requirements shall be rejected.

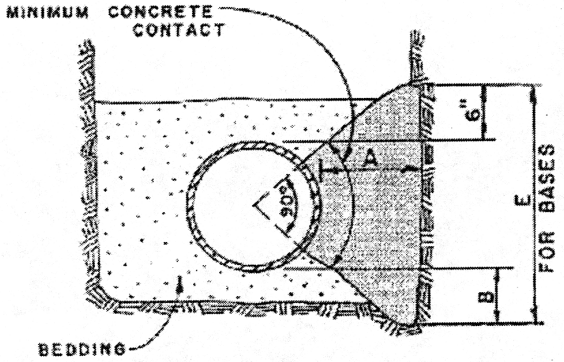
PIPE SIZE	BUTTRESS & BASE DIMENSIONS								
	A	B	22½° BEND		45° BEND		90° BEND		E
			C1	D1	C2	D2	C3	D3	
4"	9"	4"	5"	8"	5"	10"	5"	1'-4"	1'-3"
6"	1'-0"	6"	6"	9"	6"	1'-4"	6"	1'-9"	1'-8"
8"	1'-2"	8"	8"	10"	8"	1'-6"	8"	2'-6"	2'-0"
12"	1'-6"	10"	9"	1'-0"	9"	2'-0"	1'-0"	3'-3"	2'-6"
16"	2'-0"	1'-0"	10"	1'-6"	10"	2'-9"	1'-4"	4'-10"	3'-0"
20"	2'-6"	1'-4"	1'-0"	2'-0"	1'-0"	3-9"	1'-8"	6'-6"	3'-9"
24"	3'-0"	1'-6"	1'-0"	2'-3"	1'-0"	4'-6"	2'-0"	8'-0"	4'-3"



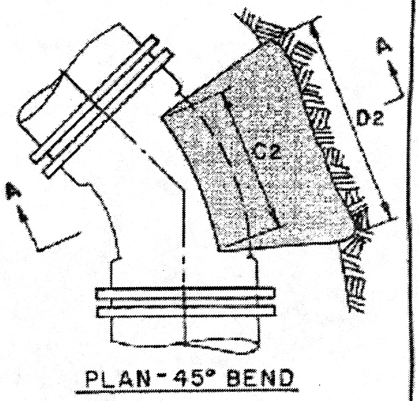
PLAN-90° BEND



PLAN-22½° BEND



SECTION A-A



PLAN-45° BEND

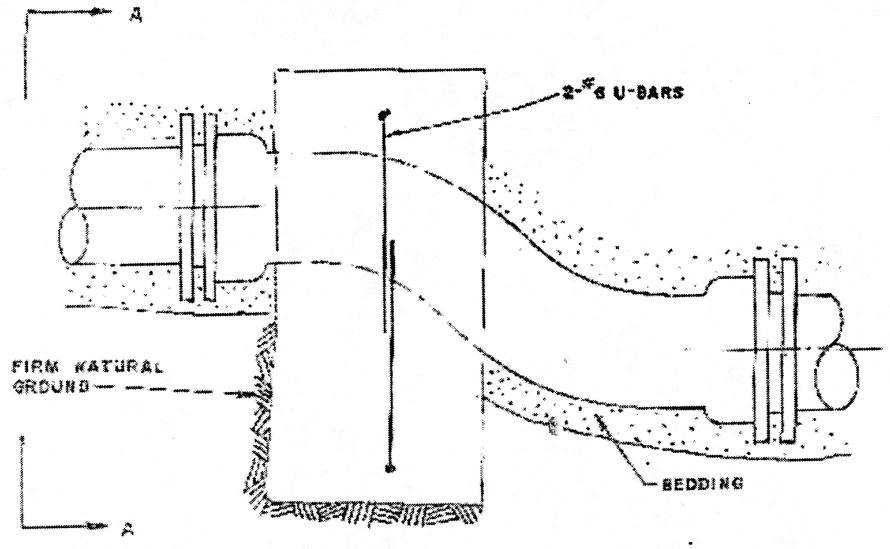
NOTES

1. PROVIDE CLEARANCE ON CONCRETE ADEQUATE FOR REMOVING MECHANICAL JOINT BOLTS.
2. POLYETHYLENE FILM ENVELOPE NOT SHOWN
3. DIMENSIONS IN TABLE ARE BASED ON A WATER PRESSURE OF 150 PSI AND A SOIL BEARING PRESSURE OF 4000 LBS. PER SQ. FT.
4. CONCRETE TO BE CLASS "F"
5. CONCRETE TO BE POURED AGAINST FIRM NATURAL GROUND

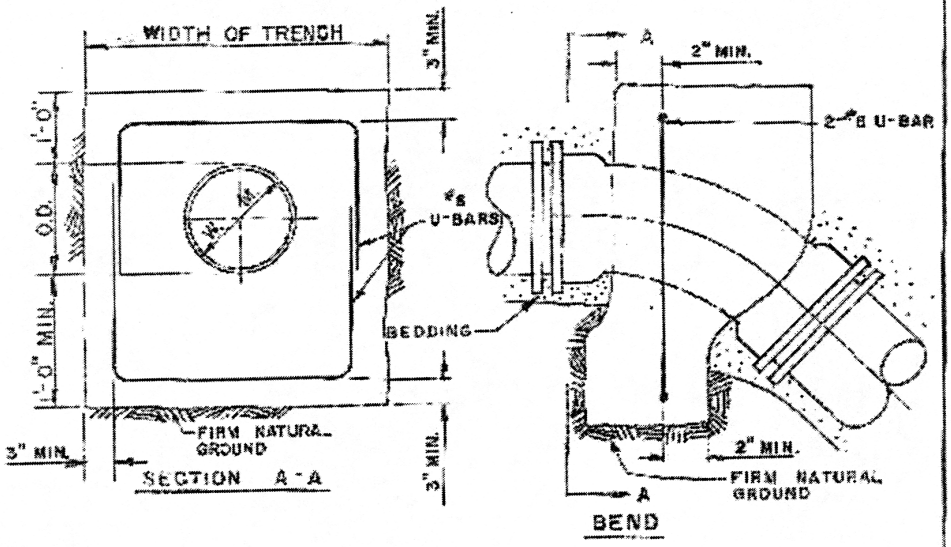
BUREAU OF ENGINEERS
WATER ENGINEERING DIVISION
DEPARTMENT OF PUBLIC WORKS.
MILWAUKEE, WISCONSIN

BUTTRESSES AND BASES
FOR 4" THROUGH 24" BENDS

DESIGNED BY E. Kalisz DRAWN BY DLP, JAS
CHECKED BY [illegible] DATE 12-19-85
APPROVED [illegible]
APPROVED [illegible] DRWG. NO. M-1



OFFSET



BEND

NOTES

1. CONCRETE VOLUMES ARE BASED ON WATER PRESSURE OF 150 PSI WITH BACKFILL OR 100 PSI WITHOUT BACKFILL
2. ALL CONCRETE TO BE CLASS "F"
3. POLYETHYLENE FILM ENVELOPE NOT SHOWN.
4. PROVIDE CLEARANCE ON CONCRETE ADEQUATE FOR REMOVING MECHANICAL JOINT BOLTS
5. ANCHOR SIMILAR TO TYPE SHOWN IN DRW'G. NO. 11 MAY ALSO BE USED FOR 6" & 8" BENDS.

ANCHOR - VOLUME OF CONCRETE - CU. YD.

PIPE SIZE	OFFSET				BEND		
	6"	12"	18"	24"	45°	22½°	11¼°
4"	0.2	0.4	0.4	NA	0.4	0.2	0.1
6"	0.4	0.6	0.7	1.7	0.9	0.4	0.2
8"	0.7	1.0	1.2	2.0	1.6	0.7	0.4
12"	1.2	1.6	1.7	2.5	SEE DWG. NO. 11		
16"	2.1	2.7	3.1	NA			

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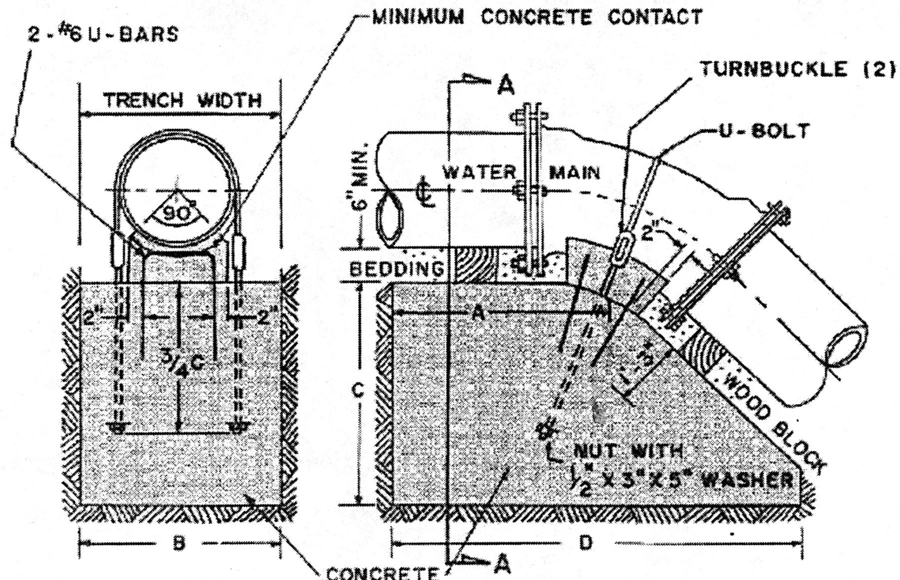
DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

ANCHOR BLOCK
OFFSETS 4"-16" BENDS 4"-8"

DESIGNED BY [illegible] DRAWN BY DLP, JAB
CHECKED BY [illegible] DATE 1-16-86
APPROVED [illegible]
APPROVED [illegible] DRW'G NO M-2



SEC. A-A ELEVATION

PIPE SIZE	ANCHOR DIMENSIONS					CU.YD. CONC.	BOLT DIA.
	BEND	A	B	C	D		
12"	11 1/4°	2'-0"	3'-1"	2'-3"	3'-6"	0.7	3/4"
	22 1/2°	3'-0"	3'-1"	3'-0"	5'-3"	1.4	1"
	45°	4'-0"	3'-1'	4'-3"	6'-9"	2.6	1"
16"	11 1/4°	2'-8"	3'-5"	2'-6"	5'-0"	1.2	1"
	22 1/2°	3'-9"	3'-5"	3'-6"	6'-9"	2.3	1"
	45°	5'-6"	3'-5"	5'-0"	8'-9"	4.5	1 1/8"

NOTES:

1. DESIGN IS BASED ON WATER PRESSURE OF 150 PSI WITH BACKFILL OR 100 PSI WITHOUT BACKFILL.
2. ALL CONCRETE TO BE CLASS "F".
3. CONCRETE TO BE POURED AGAINST FIRM NATURAL GROUND.
4. POLYETHYLENE FILM ENVELOPE NOT SHOWN.
5. AFTER ASSEMBLY ALL FERROUS MATERIALS OUTSIDE OF THE POLYETHYLENE ENVELOPE SHALL BE TOTALLY ENCAPSULATED WITH PLASTIC ROOFING CEMENT CONFORMING TO ASTM D-2822.
6. ANCHOR FOR BEND GREATER THAN 45° SHALL BE INDIVIDUALLY DESIGNED AS INDICATED ON THE PLAN.

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DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

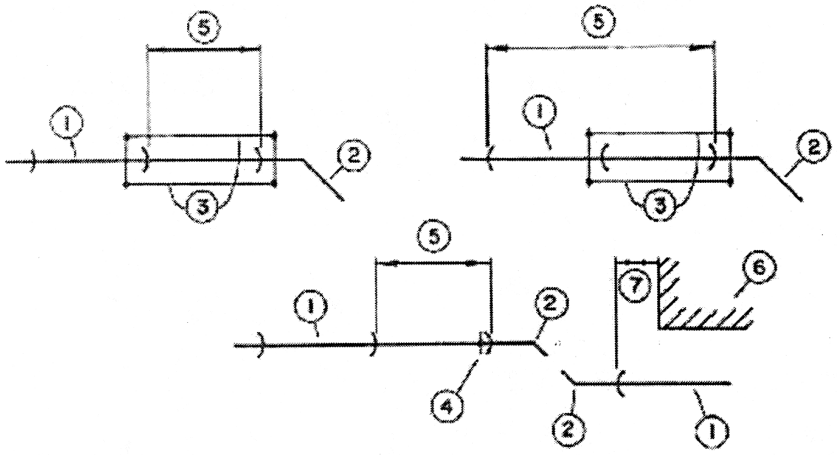
ANCHOR FOR 12" & 16" BENDS

DESIGNED BY DRAWN BY M.A.D.L.P
CHECKED BY DATE 4-8-1986
APPROVED
APPROVED DRWG. NO. M-3

PIPE DIA.	BENDS		OFFSETS			
	DEGREE OF BEND		OFFSET DIMENSION			
	22 1/2°	45°	6"	12"	18"	24"
4"	6'	12'	10'	14'	16'	-
6"	8'	16'	12'	16'	20'	35'
8"	12'	20'	16'	22'	24'	35'
12"	15'	26'	18'	24'	27'	35'
16"	18'	36'	19'	26'	30'	-

NOTE:
LENGTH TO BE RESTRAINED BASED ON WATER PRESSURE OF 150 PSI, BACKFILL IN PLACE AND PIPE DOUBLE WRAPPED IN POLYETHYLENE.

LENGTHS IN FEET OF PIPE TO BE RESTRAINED AT CHANGES IN DIRECTIONS



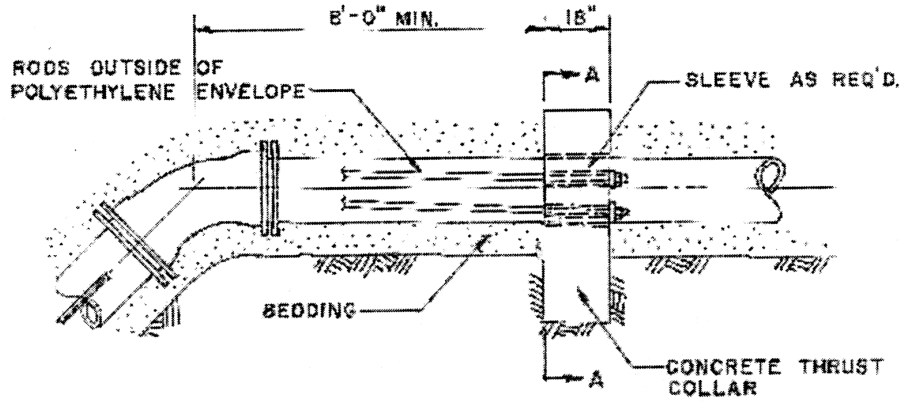
RESTRAINED LENGTHS - TYPICAL SITUATIONS

1. WATER MAIN
2. FITTING (BEND OR OFFSET)
3. BELL RESTRAINT TO BELL RESTRAINT (SEE DRAWINGS NO.S 13 AND/OR 14)
4. BELL-SPIGOT RESTRAINT, M.J. (SEE DRAWING NO. 15)
5. LENGTH OF PIPE RESTRAINED
6. UNDERGROUND OBSTRUCTION
7. MINIMUM JOINT CLEARANCE = 2'

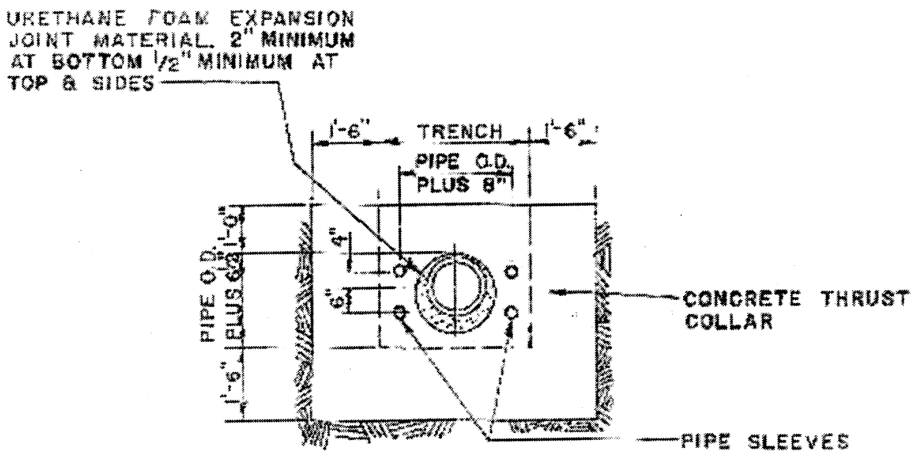
BUREAU OF ENGINEERS
WATER ENGINEERING DIVISION
DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

RESTRAINED LENGTHS
4"-16" BENDS & OFFSETS

DESIGNED BY [signature] DRAWN BY VG/DLP
CHECKED BY [signature] DATE 12-16-86
APPROVED [signature]
APPROVED [signature] DRWG. NO. M-4



ELEVATION



SECT. A-A

NOTES

1. THRUST COLLAR DESIGN BASED ON WATER PRESSURE OF 150 PSI AND ON SOIL BEARING PRESSURE OF 4000 LBS. PER SQ. FT.
2. CONCRETE TO BE CLASS "A" OR H.E.S.
3. CONCRETE TO BE POURED AGAINST FIRM NATURAL GROUND.
4. FOR RODS AND ATTACHING DETAILS SEE DRW'GS. NO.13 AND NO.14
5. POLYETHYLENE FILM ENVELOPE NOT SHOWN.
6. AFTER ASSEMBLY ALL FERROUS MATERIALS OUTSIDE OF THE POLYETHYLENE ENVELOPE SHALL BE TOTALLY ENCAPSULATED WITH PLASTIC ROOFING CEMENT CONFORMING TO ASTM D-2822
7. FOR 6" OR 8" ONE PAIR OF RODS WOULD BE REQUIRED.

BUREAU OF ENGINEERS
WATER ENGINEERING DIVISION
DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

THRUST COLLARS
12" AND 16" BENDS

DESIGNED BY E. Kalina DRAWN BY DLP JAS
CHECKED BY Walter Cole DATE 1-21-86
APPROVED
APPROVED DRWG. NO. M-5

APPENDIX N

SPECIFICATION FOR COMPRESSION COUPLING CONNECTORS USED ON COPPER AND/OR LEAD SERVICE PIPING

I. GENERAL REQUIREMENTS

The compression fitting shall conform to ANSI/AWWA C800 except as modified in the technical requirements as described herein.

II. TECHNICAL REQUIREMENTS

A. Description

A compression fitting is a fitting for tube or pipe which seals and grips by radial deformation of circumferential sealing elements.

B. Material

1. Castings shall be made from copper alloy number C83600, in accordance with the chemical and mechanical requirements of ASTM B62 or ASTM B584.

2. Seal shall be made of BUNA-N Rubber, with a durometer of 70.

3. Joint Nut shall be Silicon Bronze. ASTM - B371 Alloy 694.

4. Clamp Ring hardware, If used, shall be silicon bronze or stainless steel.

C. Workmanship

All castings shall be sound and clean without defects that shall impair their service. No plugging, impregnation, welding or repairing of such defects shall be allowed.

III. INSPECTION AND CERTIFICATION

Upon demand, the manufacturer shall furnish a report that shall certify the physical properties and chemical analyses of the metal used for the castings, joint nut, and seal of each fitting. Materials that do not meet all specification requirements shall be rejected.

APPENDIX O

SPECIFICATIONS FOR BRONZE CHECK VALVES

I. GENERAL REQUIREMENTS

Bronze check valves under this specification shall conform to MSS SP-80 as modified herein. Valves shall be installed in building piping and water meter installations and shall meet current code requirements in full.

II TECHNICAL REQUIREMENTS

A. Description
Check valves shall have a rating of 125 psig and be Type 3 or Type 4 swing check.

B. Material
Valve body shall be cast bronze, conforming to ASTM B62-C83600 or ASTM B61-C92200.

C. Design
1. End Connections shall be female I.P. pipe threads made in accordance to ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).

2. The seat may have an expanded-in, threaded-in, or otherwise renewable seat ring or may be cast integral with the body at the manufacturer's option.

3. The disc and disc holder shall be securely fastened to the hanger or hinge. The connection shall allow sufficient freedom so that the disc shall properly seat by gravity.

D. Testing
Each valve shall be tested in accordance with MSS SP-80.

E. Workmanship
Valve parts shall be designed and manufacturing tolerances set so as to provide interchangeability in the product of any one manufacturer between units of the same size, class, type, and design, except the individual fit of the disc in the body. All castings shall be sound and clean without defects that shall impair their service. No plugging, impregnation, welding or repairing of such defects shall be allowed.

III. INSPECTION AND CERTIFICATION

Upon demand, the manufacturer shall furnish a report that shall certify the duration and

pressure of all hydrostatic and/or pneumatic tests, the physical properties and chemical analyses of the metal used for the stem, body, bonnet and disc, also the assembled weight of each valve. Materials that do not meet all specification requirements shall be rejected.

APPENDIX P

SPECIFICATIONS FOR IRON CHECK VALVES

I. GENERAL REQUIREMENTS

Iron check valves under this specification shall conform to MSS SP-71 as modified herein. Valves shall be installed in building piping and water meter installations and shall meet current code requirements in full.

II TECHNICAL REQUIREMENTS

A. Description
Check valves shall have a rating of 125 psig and be Type 1, Type 2, Type 3 or Type 4 swing check.

B. Material
Valve body shall be cast iron, conforming to ASTM A126 Class B, "Grey Iron Castings for Valves, Flanges, and Pipe Fittings."

C. Design
1. End flanges shall be integral with the valve body. Dimensions, tolerances, and drilling shall be in accordance with ASME/ANSI B16.1.

2. The closure assembly shall be designed to assume the closed position by gravity under no flow conditions in a horizontal pipeline. Special arrangements of levers and springs or weights may be necessary to assure proper closure in lines which are inclined or vertical.

3. Disc seating surfaces may be integral or may be separate rings securely fastened to the disc.

D. Testing
Each valve shall be tested in accordance with MSS SP-71.

E. Workmanship
Valve parts shall be designed and manufacturing tolerances set so as to provide interchangeability in the product of any one manufacturer between units of the same size, class, type, and design, except the individual fit of the disc in the body. All castings shall be sound and clean without defects that shall impair their service. No plugging, impregnation, welding or repairing of such defects shall be allowed.

III. INSPECTION AND CERTIFICATION

Upon demand, the manufacturer shall furnish in triplicate a report that shall certify

the duration and pressure of all hydrostatic and/or pneumatic tests, the physical properties and chemical analyses of the metal used for the stem, body, bonnet and disc, also the assembled weight of each valve. Materials that do not meet all specification requirements shall be rejected.